

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE

A A = Add
C = Change
D = Delete

Amendment Number

DOCUMENT CODE

3

COUNTRY/ENTITY
SUDAN

3. PROJECT NUMBER
650-0069

4. BUREAU/OFFICE

AFR

16

5. PROJECT TITLE (maximum 40 characters)

WESTERN AGRICULTURAL MARKETING ROAD

6. PROJECT ASSISTANCE COMPLETION DATE (PACD)

MM DD YY
11 2 31 9 1

7. ESTIMATED DATE OF OBLIGATION
(Under "B" below, enter 1, 2, 3, or 4)

A. Initial FY 84 B. Quarter 4

C. Final FY 87

8. COSTS (\$000 OR EQUIVALENT \$1 =)

A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total	15,680		15,680	60,000		60,000
(Grant)	(15,680)	()	(15,680)	(60,000)	()	(60,000)
(Loan)	()	()	()	()	()	()
Other U.S. 1.						
Other U.S. 2.						
Host Country					41,000	41,000
Other Donor(s)				42,000		42,000
TOTALS	15,680		15,680	102,000	41,000	143,000

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMAR. TECH CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) ARDN	133	252				60,000		60,000	
(2)									
(3)									
(4)									
TOTALS						60,000		60,000	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)

821

11. SECONDARY PURPOSE CODE

140

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code

BS

B. Amount

13. PROJECT PURPOSE (maximum 480 characters)

To provide and maintain an efficient, all-weather link between the agricultural areas of western Sudan and national and international markets via Kosti, Khartoum and Port Sudan.

14. SCHEDULED EVALUATIONS

Interim MM YY MM YY Final MM YY
1 0 8 6 0 4 8 8 0 5 9 0

15. SOURCE/ORIGIN OF GOODS AND SERVICES

000 941 Local Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a page PP Amendment)

17. APPROVED BY

Signature

Title

Date Signed

MM DD YY

18. DATE DOCUMENT RECEIVED IN AID/W. OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION

MM DD YY

The AID project consists of constructing and providing maintenance for an all weather road from Tendelti to El Obeid, a total distance of 185 kilometers. ADB will provide parallel financing for a 116 kilometer road segment connecting Tendelti to Kosti. El Obeid, the capital of Kordofan Region, is a major agricultural marketing center. Kosti, the eastern terminus of the project road, is a major rail and river port as well as a link in the paved road network to Khartoum and Port Sudan. The road will be constructed as a 7 meter wide, two lane roadway with 1.5 meter shoulders and a double bituminous surface treatment. Maintenance is an integral part of the project. Funding will be provided for technical services, equipment and supplies/materials to maintain the entire road. Policy reforms related to maintenance of this and other roads in the Sudan are closely tied to the World Bank's Third Highway Project, which is just commencing.

Ultimate beneficiaries of this project will be over 3,000,000 Sudanese engaged in traditional farming in the area of project influence. The project will also benefit the mainly private sector truck owners who operate, on average, five vehicles each.

B. Financial Summary of the Project:

1. The AID life of project funding, summarized below, will total \$60,000,000, of which \$15,680,582 is to be obligated in FY 1984.

<u>U.S. REQUIREMENTS</u>	<u>FIRST YEAR</u>	<u>LOP</u>
Construction	\$13,500,582	\$53,330,000
Engineering Services	\$ 2,180,000	\$ 5,040,000
Maintenance:		
Commodities		\$ 660,000
Technical Assistance		\$ 340,000
	<hr/>	<hr/>
Total	\$15,680,582	\$59,370,000

2. The GOS will provide \$41,000,000 in local currency covering salaries, supplies, housing, utilities, and audits. The ADB will provide \$41,270,000. The U.S. contribution totals 42% of total road costs; ADB, 29%; and the GOS in excess of 25% of the road costs for the section funded by AID (this includes cash and in kind contributions, including the land upon which the road will be constructed), and in excess of 29% of total road costs. Total project cost of the entire road, including AID and non-AID contributions, is \$143,000,000.

C. Socio-Economic, Technical, and Environmental Description:

1. The project has been appraised as a socially worthwhile activity. The project will create a reliable road link that will (1) offer local farmers a cheaper and more reliable outlet for their produce; (2) lead to lower transport costs, resulting in increased producer profits which will encourage greater production; (3) provide a more reliable source of agricultural inputs such as implements, fuel, seeds and fertilizers; (4) stimulate extension and social services in the area of project influence; (5) encourage beneficial changes in farm financing and technology; and (6) stimulate the further development of private sector trucking.
2. There are no human rights implications for this activity.
3. The activities identified in the Project ^{Paper} ~~Agreement~~ were judged to be technically sound.
4. A negative determination for environmental matters has been approved.

D. Implementation:

1. Conditions and covenants to ensure timely implementation of the project are included in the attached authorization.

Clearances

DAA/AFR/ESA, PBirnbaum <i>PB</i>	Date	8-11-84
AFR/EMR/RCS, DBrown <i>et Rite</i>	Date	8-16-84
AFR/DP, HJohnson <i>given for</i>	Date	8-9-84
AFR/EA, ESpriggs <i>[Signature]</i>	Date	8/10/84
AFR/PD, NCohen <i>[Signature]</i>	Date	8/10/84
AFR/PD/EAP, JHeard <i>[Signature]</i>	Date	8/9/84
AFR/TR/ENG, JSnead <i>[Signature]</i>	Date	8/8/84
AFR/TR/ARD, DSchaer <i>[Signature]</i>	Date	8/9/84
GC/AFR, TBork <i>[Signature]</i>	Date	8/14/84

Drafted: AFR/PD/EAP, Weinstein: 632-8286:7/24/84:1041J

Abbreviations

A&E:	Architect and Engineer.
AADT:	Annual Average Daily Traffic.
AASHO:	American Association of State Highway Officials
ADB:	African Development Bank.
AID:	Agency for International Development.
APS:	Agricultural Planning and Statistics Project.
CBD:	Commerce Business Daily.
CIP:	Commodity Import Program.
CP:	Condition Precedent.
DAH:	Dar Al Handasah, Consulting Engineers.
GOS:	Government of Sudan.
IES:	Institute of Environmental Studies.
IFB:	Information for Bidders.
IRR:	Internal Rate of Return.
JICA:	Japan International Cooperation Agency.
KM:	Kilometer.
L.S.:	Sudanese Pounds.
MFEP:	Ministry of Finance and Economic Planning.
NORAD:	Norwegian Aid
NORCONSULT:	Norwegian Consulting Firm.
NPV:	Net Present Value.
PACD:	Project Assistance Completion Date.
PID:	Project Identification Document.
PM:	Person Month.
PP:	Project Paper.
RBPC:	Roads and Bridges Public Corporation.
REDSO:	Regional Economic Development Services Office.
RITES:	Rail India Technical and Economic, Ltd.
RFP:	Request for Proposals.
SRC:	Sudan Railways Corporation.
TYPIP:	Three Year Public Investment Program.
UNDP:	United Nation Development Program.
USAID:	U.S. Agency for International Development.
VOC:	Vehicle Operating Cost.
VPD:	Vehicles per Day.
WSARP:	Western Sudan Agricultural Research Project.

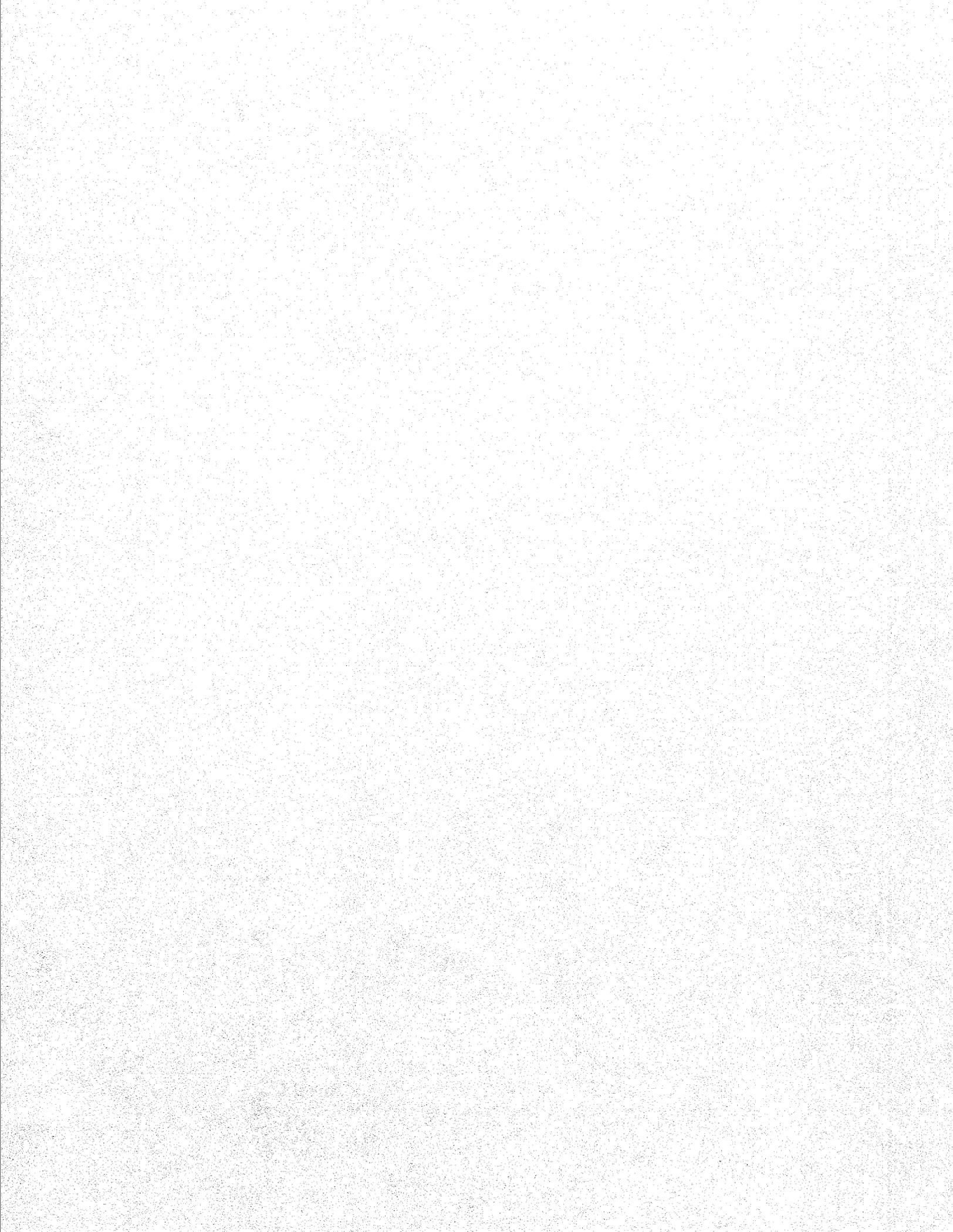


Table of Contents

	<u>Page</u>
I. Summary and Recommendations	1
II. Project Rationale and Background	6
A. Rationale	6
B. USAID Program	7
C. Background and Setting	9
D. Logframe Narrative	12
III. Project Description and Components	15
A. Project Description	15
B. Project Components	16
1. Contracting	16
2. Engineering Services (A&E)	18
3. Construction Services	18
4. Maintenance Component	18
5. Maintenance of the Connecting Road Network	23
IV. Cost Estimates and Financial Plan	25
A. Introduction	25
B. Estimated Costs	27
C. Methods of Implementation and Financing	28
D. Payment of Invoices and Audits	29
E. Recurring Cost	30
F. Project Obligations in Relation to USAID OYB	30
V. Implementation Plan	34
A. Master Plan/Schedule	34
1. Introduction	34
2. Detailed Schedule	35
3. Implementation Responsibilities	38
4. Summation of Responsibilities	40
B. Administration/Monitoring	43
C. Evaluation	44

VI. Project Analysis	46
A. Technical	46
B. Economic	49
C. Social Analysis	55
D. Administrative	57
E. Environmental	60
F. Capital vs Labor Intensive Road Construction	60
G. Analysis of the Energy Efficiency, Cost Implications and Appropriateness	61
VII. Conditions and Covenants	62

Annexes

1. PID Approval Message
2. Logframe
3. Statutory Checklist
4. B/G Request for Assistance
5. FAA Section 611(e) Certification
6. Detailed Project Analyses
 - A. Technical
 - B. Economic
 - C. Financial
 - D. Social
 - E. Administrative/Institutional Analysis - RBPC
7. Alternatives to the Proposed Road
8. Collection and Use of Tolls
9. Implementation Documents
 - A. Notice of Request for Engineering Services
 - B. Notice of Request for Pre-qualification of
Construction Contractors
10. Institute for Environmental Studies-
Scope of Work
11. Project Maps

I. Summary and Recommendations

A. Purpose of Project

The purpose of the Western Agricultural Marketing Road project is to provide and maintain an all-weather road link between the agricultural areas of western Sudan and national and international markets via Kosti, Khartoum and Port Sudan. The project road will result in cheaper and more reliable transportation, which is the link between the project purpose and the project goal to increase production and income in the rainfed agricultural area of western Sudan and to increase Sudan's export earnings.

B. Description of Project

At present, road traffic between Kosti and El Obeid moves on a system of non-permanent tracks created over the years by trucks. Under good dry season conditions, the 301 kilometer journey takes twelve hours. The same distance can take several days to cover during the wet season because of flash floods and sticky clay soils. The tracks run on natural ground, and no surface improvements or maintenance are carried out. When a track deteriorates, truck drivers simply abandon the original route and create a new one.

The project road from Kosti to El Obeid, a distance of 301 kilometers, will have a 7.0 meter-wide, two-lane roadway with 1.5 meter shoulders and a double bituminous surface treatment. It will be financed and built in two separate sections, with construction proceeding simultaneously. The 116 kilometers from Kosti to the Tendelti area will be financed by the African Development Bank (ADB) and have engineering services furnished by NORCONSULT, a Norwegian consulting firm. AID will finance the 185 kilometer section from the Tendelti area to El Obeid, with engineering services supplied by a U.S. firm under a host country contract.

Construction services on the AID-financed part of the road will be executed through a host country contract between the Roads and Bridges Public Corporation (RBPC) and the selected construction contractor. Completed sections of road will be maintained for one year under the construction contract prior to final acceptance by the RBPC. All the contractor's construction and maintenance responsibilities are expected to be completed by April 1991.

Maintenance is an integral part of the project. Upkeep of all paved roads in Sudan is the responsibility of the RBPC. The World Bank and the RBPC, under the Third Highway Project, are working to strengthen the RBPC's institutional and administrative capabilities in road maintenance. Upon completion of the Third Highway Project in 1988, the RBPC should have the organizational and technical capacity to maintain the national and paved road system.

In executing the project, several measures will be taken to improve the RBPC's capabilities. The construction contractor will build his construction camp at Umm Ruwaba to such a standard that it will serve after construction as a permanent maintenance workshop. A less elaborate camp will be built at El Rahad to act as a maintenance facility but not as a fully equipped workshop. Pipe, asphalt cutback, and aggregates will be stockpiled at the maintenance centers for use on the road. At mid-point in the construction period, 1988, the engineering consultant will study regional maintenance needs and recommend additional maintenance equipment and technical assistance to be financed under the project.

The GOS has decided that the project road will be a toll road. Projections of toll collections indicate that tolls themselves should be sufficient to finance routine maintenance. The broader subject of covering recurrent costs for maintaining Sudan's road network, including the Kosti-El Obeid road, is being addressed through the Third Highway Project. Over the next four years the RBPC and the World Bank will have identified and costed out recurrent maintenance requirements and devised mechanisms to assure they are met. USAID will closely monitor the progress being made toward that goal and coordinate with the World Bank throughout the implementation of the Third Highway Project.

C. Background

The project for the Kosti-El Obeid road evolved over several years. The two major transport master plan studies undertaken in Sudan, by Lockheed (1966) and the Association for the Development of Arab Resources, Inc. (1974), supported building the road. And a similar recommendation was made by the Louis Berger International, Inc., highway system plan in 1973. The Government of Sudan (GOS) has put a high priority on extending the paved road network to El Obeid.

The project has been extensively studied over the past five years. NORCONSULT studied the Kosti-Umm Ruwaba section of the road and established its feasibility in a report published in 1978. This report was followed in 1981 by detailed engineering and design work, again by NORCONSULT. In 1978, the Japan International Cooperation Agency (JICA) prepared a feasibility study, together with a preliminary engineering report, on the second section of the road, Umm Ruwaba-El Obeid. In 1982, Dar Al Handasah, a Lebanese consulting firm, used JICA's material to develop detailed engineering plans, final design proposals and model tender documents. Berger reappraised the project road in November 1983 for USAID and developed a set of recommendations for the design standards and tender documents. The Project Paper has relied heavily on Berger's recommendations.

The proposed road traverses a major rainfed agricultural area. Production in the region centers on livestock, sorghum, millet, groundnuts, sesame and gum arabic. All crops are produced under rainfed conditions and, except for millet, which is a substitute for imported wheat, contribute significantly to Sudan's export earnings. Poor marketing infrastructure, particularly transport, limits the potential for agricultural growth. High transport costs minimize the advantage of shipping crops to markets where prices are higher. Poor access makes the transport of essential inputs more difficult and

expensive. It also limits the incentive to increase production since inability to evacuate crops from surplus areas will cause added surplus to depress producer prices.

A healthy, competitive trucking industry such as Sudan's is essential for the project's success. Both the number and size of freight-carrying vehicles in Sudan has increased noticeably over the past decade. Moreover, most trucks are owned by private companies and individuals, 71% of the total fleet in 1979. Except for a few large companies, the majority of owners are small businessmen with fleets of 5 vehicles or less.

The Kosti-El Obeid road is central to USAID's strategy for assisting rainfed agriculture in the west. USAID efforts have focused on increasing agricultural inputs to private producers, restructuring market incentives, and improving roads and storage facilities. Directly related USAID projects are the Western Sudan Agricultural Research Project (WSARP), which is concerned with increasing crop productivity in the west, and the Agricultural Planning and Statistics Project (APS), which supports agricultural planning and policy reform at the national level. Completion of the road will form a complementary link among technology, policy and infrastructure to maximize incentives for private agricultural production.

D. Term of Project

The AID financial contribution to the project is a \$60 million grant to be obligated over a four year period beginning in FY 1984. The GOS contribution consists of the equivalent of \$41 million in Sudanese currency, from PL 480 Title III generated local currency.

E. Financial Plan

<u>Kosti to Tendelti area - 116 km.</u>	<u>FX in \$000</u>	<u>LS. in \$000</u>	<u>Total</u>
Construction Services	38,500 ^{1/}	15,100	53,600
Engineering Services	2,770 ^{2/}	900	3,670
Totals	FX \$41,270	LS \$16,000	\$57,270
<u>Tendelti area to El Obeid - 185 km.</u>			
Construction Services	51,900	21,900	73,800
Engineering Services	4,910	675	5,585
Totals	FX \$56,810 ^{3/}	LS \$22,575	\$79,385
<u>Maintenance Component</u>	FX \$ 2,630 ^{3/}	LS \$910	\$3,540
RBPC Salaries and Audits		LS \$1,540	\$1,540
Total Project Cost (rounded)	FX \$101,270	LS \$41,000 ^{4/}	\$142,270

^{1/} ADB financed

^{2/} NORAD financed. Rounded total is \$60 million.

^{3/} AID financed

^{4/} GOS financed

Detailed costs are based on the cost figures developed by NORCONSULT for the final design of the Kosti-Umm Ruwaba section of the road and by Dar Al Handasah for the Umm Ruwaba-El Obeid section, both of which were checked and updated in the Berger reappraisal. The base costs used for the cost analysis are from the Berger study, escalated for inflation from mid-1983 to the mid-construction point. An inflation rate of 7 1/2% per annum was used for the foreign exchange portion and 25% per annum for the local currency part. All costs include a 10% contingency factor.

F. Use of Small, Small Disadvantaged and Women-Owned Firms

The engineering services and construction contracts required for this project are large and require extensive home office support and backstopping. The engineering services firm will be selected on the basis of experience and the ability to furnish qualified personnel and home office assistance. The construction contractor will be chosen on the basis of experience in constructing similar road projects and the financial ability to field and support a large construction effort in a foreign country. The firms chosen must have access to adequate finance and bonding. Because of these stringent requirements, USAID has concluded that it is not feasible to use small, disadvantaged or women-owned firms for this project.

G. Waivers

None

H. Major Conditions Precedent and Covenants

As of late June the ADB and GOS agreed on a repayment plan for GOS arrears that will secure ADB financing for this project. USAID will review GOS performance on this plan and assure that it is acceptable to the ADB before signing the Project Agreement to finance the Tendelti to El Obeid road section.

The Grantee and the ADB have signed an agreement for ADB financing of the Kosti-Tendelti section of the Kosti-El Cbeid road, the Grantee and the ADB have agreed upon a plan for the Grantee to repay any arrearages to the ADB, and the Grantee is up to date on its repayments under such plan; all required land rights exist for implementation of the project; the plans for the ADB section of the road are compatible with those for the AID portion; and a Project Committee is established.

Because of the importance of the GOS road maintenance plans and financing, the Project Agreement will contain several covenants related to maintenance. The GOS will covenant to give AID the opportunity to review and discuss each year the annual road maintenance requirements and corresponding physical targets and release of funds that will be developed with World Bank assistance under the Third Highway Project. The GOS will covenant to give AID the opportunity to review the plans and implementation of the vehicle dimensions and axle-load regulations to be adopted by January 1, 1987, also under the Third Highway Project. The GOS will covenant to convene annually a meeting of all donors to the transportation sector to coordinate activities and inform them of GOS policy decisions relating to transportation.

I. Recommendations

The conclusions of the analyses made for the Project Paper are all positive. The project is an integral part of USAID's agriculture strategy. It complements on-going and planned projects, policy dialogue efforts, and private agricultural development. The importance of the Kosti-El Obeid road is stated in the GOS Three Year Public Investment Program. It is recommended that the Administrator authorize a \$60 million grant for the project.

K. Project Team Members

1. AID

Project Development Officers: Arthur Thivierge, PSC
Eugene Morris, USAID/Sudan
Peter Kranstover, USAID/Sudan
Carlos Pascual, USAID/Sudan
Richard Macken, USAID/Sudan

Engineers: Robert Adams, REDSO/ESA
Lynn Sheldon, USAID/Sudan
David Gephart, PSC

Economists: Thomas Eighmy, USAID/Sudan
Azhari A/Karim, USAID/Sudan

Social Scientist: David Sherry, USAID/Sudan

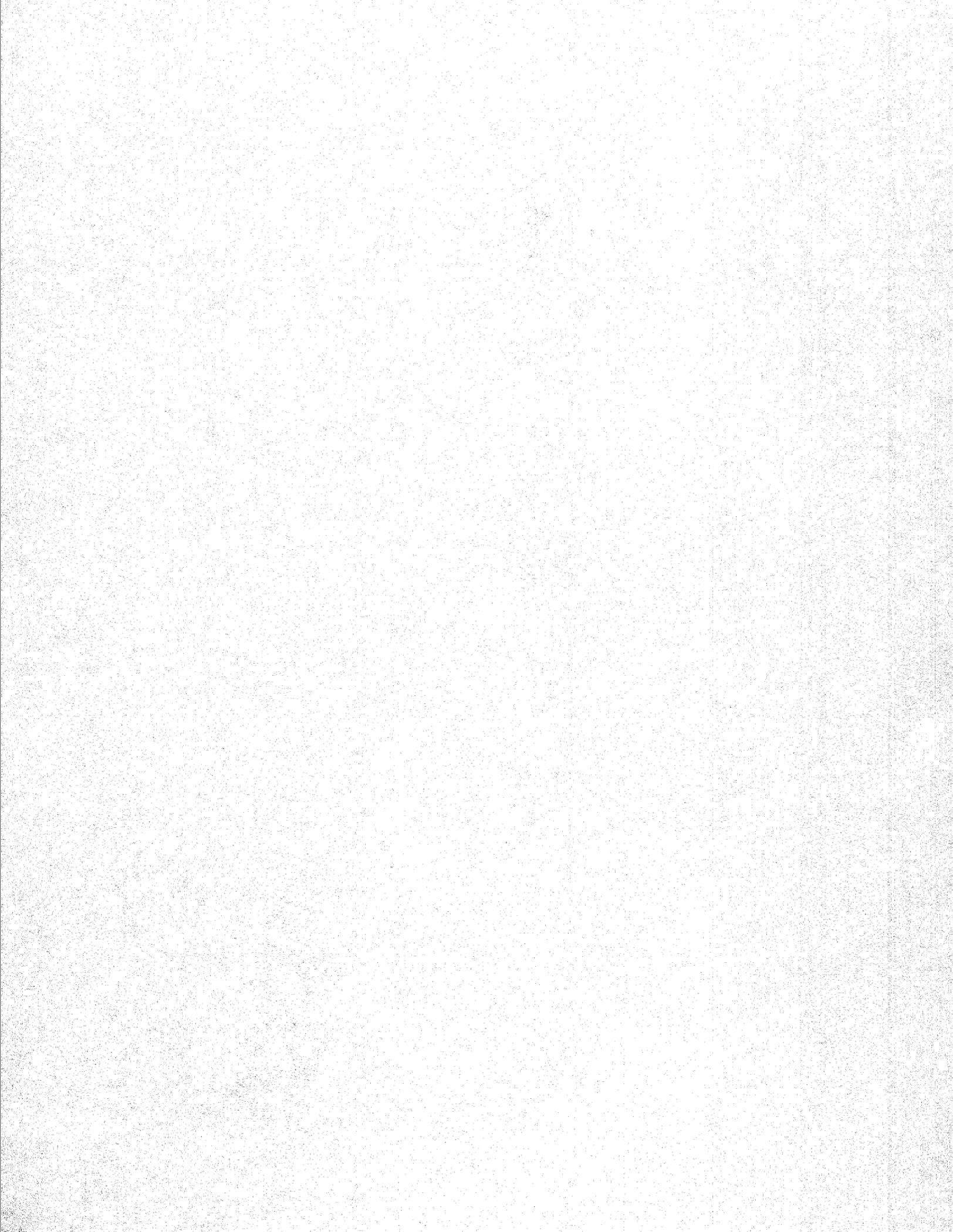
Environmentalist: John Gaudet, REDSO/ESA

Regional Legal Advisor: Ed Dragon, REDSO/ESA

2. Government of Sudan

Engineer, RBPC: Mohamed El Khair

Transport Section, MFEP: Abdel Rahim



II. Project Rationale and Background

A. Project Rationale

USAID's assistance strategy for agriculture is specifically directed towards the large number of farmers in the rainfed sector who have the potential, given supporting infrastructure and an improved policy environment, to increase their crop and livestock production for domestic and international markets. To achieve the development goals of the western region, the area's productive agricultural lands must be linked to the national road network.

The Western Agricultural Marketing Road is one manifestation of USAID's efforts to improve agricultural infrastructure. This road will provide an all-weather route between Kostî in White Nile Province and El Obeid, the capital of Kordofan Region. Kostî is both a railroad and river town, with a port on the White Nile River. All-weather roads connect Kostî with Sudan's capital, Khartoum, 336 kilometers to the north, and with Fort Sudan on the Red Sea. A road from Kostî through Umm Ruwaba to El Obeid would connect western Sudan, an area rich in agricultural potential, with the central transportation network. Upgrading the road to paved standards is the only feasible way to overcome high vehicle operating costs, handle projected traffic levels, and thus further develop commercial agriculture in the west.

Both the GOS and USAID agree that improved infrastructure must be complemented by increased investment in agriculture and policy reform if the full benefits of better roads are to be realized. Consequently, USAID's agricultural strategy during the past year has focused on agricultural inputs to private producers and a restructuring of market incentives, as well as infrastructure investments in roads and storage. Accompanied by an ongoing policy dialogue, this focus represents a logical step forward in USAID programming in Sudan. The expected results from this strategy are greater production for local consumption and export, diversification of export crops, and reduced dependence on imported wheat.

USAID agricultural assistance has emphasized the rainfed rather than the irrigated sector because of the rainfed sector's contribution to both domestic and export markets and its potential for growth. In the past year several important macroeconomic policy changes and project activities improved the environment for agricultural development and private sector expansion. Changes in import policies and currency devaluations eliminated many implicit subsidies to irrigated agriculture that encouraged excessive mechanization. The GOS raised consumer and producer wheat prices to import parity, providing incentives to producers while encouraging consumption of Sudan's staple crop, sorghum, which is a substitute for wheat. Applied research and planning projects have come on line, providing technical and policy input to keep long-term development efforts on track.

With financial and technical limits to what can be done effectively, concentrating on private rainfed agriculture is a sound way to narrow the scope of our efforts. In contrast to irrigated production, rainfed farming's labor-intensive nature and the minimal foreign exchange required for capital inputs make possible high returns from incremental investments in technology and supporting infrastructure. Mechanized farming, while somewhat dependent on imported capital, relies on machines solely for land preparation and sowing; weeding and harvesting are performed manually. More importantly, rainfed production is critical to Sudan's food security. Mechanized farmers in the rainfed area produce, on the average, 55 percent of Sudan's sorghum. Other commercial farmers in the rainfed sector produce another 35 percent of the nation's sorghum, as well as 100 percent of the millet, 75 percent of the peanuts, 70 percent of the sesame and virtually all of the livestock. Overall, rainfed agriculture is the key producer in Sudan's economy, accounting in 1982 for 81 percent of the net foreign exchange earnings in agriculture and 65 percent of the country's entire gross foreign exchange earnings.

USAID's rainfed strategy has three basic components: (1) increasing the income earned from current production, thus encouraging additional investment in agriculture; (2) increasing productivity, thereby increasing total production and income; and (3) instituting policy reforms that will provide incentives for farmers, agri-businesses, merchants and transporters to increase the production and marketing of agricultural products. Geographically, assistance has focused on western Sudan and part of the south - Equatoria and Bahr El Ghazal. Both regions were chosen for the potential productivity of the land, proximity to important market centers, on-going development of applied research, comparative advantage in the production of crops and livestock, and the large numbers of farmers in each area.

B. USAID Program

Increased productivity in the west is being addressed through the Western Sudan Agricultural Research Project (WSARP) and the distribution of high-yielding sorghum and groundnut seeds by private merchants. WSARP's research efforts have focused on increasing the productivity of individual crops and adapting internationally developed varieties to the constraints and potentials of existing farm conditions. While the project's four agricultural research centers address bio-technical elements of farming practices, extension efforts provide a feedback loop to assess the human environment and integrate socio-economic conditions with technical findings. Farmers can thus adopt new technologies more readily, and insights are gained on using credit and storage as production incentives.

Efforts in policy analysis and planning are closely interconnected. Together with infrastructure improvements they enhance incentives to increase production. The Agricultural Planning and Statistics (APS) Project supports planning at the national level, and produced (among other documents) the key paper that justified an increase in producer wheat prices to import parity level based on the free market exchange rate. As results emerge from APS food and policy studies, they are incorporated into PL 480 reforms and self-help measures. Through CIP negotiations, the Energy Planning and Management Project, and the Policy Analysis and Implementation Program, the Mission has a wide range of alternatives for influencing policy issues.

With a firm understanding of the constraints to rainfed agriculture and with activities initiated in research, planning and policy dialogue, USAID began to address infrastructure problems as the next logical step toward increasing farm production. Through various studies and its own analyses, USAID found that even before extension and credit activities -- two traditional components of increased agricultural production -- the fundamental problem of reaching production areas had to be resolved, along with developing better ways to store and move crops and inputs. Analyses have also shown that increasing production without providing transport to export sites and shortage areas will only depress producer prices in isolated production pockets. These production benefits, moreover, represent only a fraction of the total impact of improved infrastructure since roads and other transport improvements have extensive social benefits such as better access to health centers and government services.

The proposed project is the next phase in a comprehensive strategy to promote commercial rainfed agriculture in the west. USAID's transportation strategy objectives are to encourage increased agricultural production and marketing in the western and southern regions by:

- (a) improving and maintaining access to and from the southern and western regions to major national and international markets, and
- (b) improving and maintaining key intra-regional transportation links.

In the west, this means improved road facilities for access to national and international markets via Khartoum and Port Sudan. Without a major all-season trunk road linking the west to the national road network, it will be impossible to supply required farm inputs efficiently and to export production surpluses resulting from GOS, USAID and donor supported programs in the region. In fact, in the absence of efficient means for transporting agricultural surpluses, much of the income and incentive effects from efforts in research, extension and agricultural policy reform will be unrealized. For example, high transport and marketing costs contribute significantly to the large gap between farm gate and border prices. The only feasible way to remedy this is to upgrade highway conditions to paved standards.

The GOS has incorporated this emphasis on infrastructure, particularly in rainfed farming areas, into its latest Three Year Public Investment Program (TYPIP) published in October 1983. The three basic investment criteria presented in the program are: rehabilitation of the economy's productive capacity, completion of economically viable on-going projects, and implementation of projects designed to alleviate the country's critical infrastructure bottlenecks. Actual budgetary allocations reflect these investment priorities. The agricultural sector will receive 32 percent of total investments proposed in the TYPIP. All new agricultural projects in the investment plan will support the rainfed sector. Almost 19 percent of the budget will finance agriculture-related infrastructure for transportation and communications.

Among new infrastructure projects, the TYPIP states that the "Kosti - Umm Ruwaba - El Obeid road is the most important as its completion will create the first all-weather road link between Western Sudan and the rest of the country." The TYPIP goes on to state that "agricultural production in Western regions will benefit directly from this road as transportation of surplus production from these regions continues to be a bottleneck in sustaining production at the high levels for which the potential has been demonstrated in recent years."

In developing the rationale for the Kosti - El Obeid road, two alternatives were considered. The map shows that the proposed road runs parallel to an existing railroad, while a shorter route to Khartoum is a direct line northeast from El Obeid across the desert. The railroad has been the subject of several studies and the recipient of a large capital input. However, the Sudan Railways Corporation (SRC) has been deteriorating and is now at a low level of efficiency by every standard of measurement: locomotive utilization, annual traffic per wagon, wagon utilization and staff productivity. In the World Bank Third Highway Project Staff Appraisal Report, February 1984, the World Bank reviewed its assistance to the SRC since 1958 and concluded that its involvement with the SRC has not been successful. For a detailed analysis of the railroad as an alternative to the proposed road and the justification for the decision that it is not a feasible alternative, see Annex 7.

A road alignment in a northeast direction from El Obeid has also been investigated several times: by Louis Berger International, Inc., in 1973; the Association for Development of Arab Resources, Inc., in 1974; and NORCONSULT, in 1979. All three studies emphasized the importance of an integrated transport system, with an expansion of Sudan's roads to the west and south in order to provide inter-regional and international marketing links. A route from El Obeid to Khartoum not connected with the rail and port center of Kosti would not fulfill this purpose. See Annex 7 for the analysis.

C. Background and Setting

The proposed road traverses one of the major rainfed agriculture areas in Sudan in the region of Kordofan. According to the 1983 census, Kordofan, with an area of 350,000 square kilometers, has a population of approximately 3.2 million, including 800,000 nomads and transhumants. About 90 percent of the Kordofan population lives in rural areas. Half of the land is cultivable, but less than 7 percent is planted each year. The proposed road runs through both sandy qoz soils in northern Kordofan and rich clay and cracking clay soils in the southern part of the region. Land use is limited by poor access, seasonal water shortages, water logging in some areas, and limited tenant resources. Rainfall varies from year to year, with a general decline in the last few years. The growing season ranges between 30 to 70 days in the arid and semi-arid regions to 80 to 150 days in the savannah belt.

The region's economy is predominantly agricultural, producing livestock, sorghum, millet, groundnuts, sesame and gum arabic. All crops are produced under rainfed conditions and, except for millet (which is a substitute for imported wheat), contribute significantly to Sudan's export earnings. Indeed,

the World Bank concluded in November 1983 that Sudan has a clear comparative advantage in the production of nearly all crops for export and that most crops grown under rainfed conditions, particularly sorghum and sesame, show a higher comparative advantage than their counterparts grown under irrigated conditions. Since 1975 the combined share of rainfed crops in Sudan's export earnings has increased, reaching a total of 65 percent of the country's gross foreign exchange earnings in 1982. Nationwide, 47 percent of all groundnuts and 90 percent of all gum arabic are exported, with Kordofan producing 23 percent and 22 percent of their respective outputs. Livestock has become an increasingly important export, and Kordofan accounts for 16 percent of all cattle and 20 percent of all goats. Kordofan also produces 20 percent of Sudan's sorghum, the country's fastest growing export earner.

Four major types of agricultural production systems characterize western Sudan: traditional farming, modernized traditional farming, mechanized farming and nomadic herding. Traditional farming, which employs 75 percent of the region's population, produces all of the area's millet and livestock and about 35 percent of the sorghum. This type of farming is done by single families on small plots using few, if any, modern inputs. Modernized traditional farming is found in southern Kordofan where the Nuba Mountain Corporation has distributed cotton seeds and other inputs to traditional farmers. Families are still the principal production units, but most have their land plowed by tractor. Farm plots average about 15 acres.

Both types of traditional farmers are usually forced to sell their surplus crops to village buyers immediately after harvest when prices are lowest in order to pay off debts. Traditional farmers have a significant cash economy even though many of their crops are grown for personal consumption. Because of seasonal cash flow fluctuations inherent in farming, farmers usually have little choice about when to sell their crops. Most profits in the agricultural system, therefore, go to merchants who can afford to buy when prices are low and sell when they rise.

These merchants constitute the bulk of mechanized farmers. Mechanized farming, limited to land preparation with tractors and discs, has been introduced in southern Kordofan on tracts of land averaging one thousand acres. Weeding, thinning and harvesting remain manual operations done by seasonal labor from nearby traditional farms. Mechanized schemes produce mostly sorghum, although small quantities of sesame and millet are planted. Less than 10 percent of Kordofan's farmers are involved in mechanized production.

About 25 percent of Kordofan's population consists of nomadic and transhumant livestock herders living in scattered encampments. While nomads are constantly on the move, transhumants remain settled in one area for 6-8 months, moving when rains bring biting flies and mud. During the rainy season, transhumants migrate to find better grazing land further north. Livestock is trekked from southern Kordofan northward to El Obeid and Khartoum, where the best prices are offered with the onset of the rains.

The road between Kadugli and Dubeibat (a distance of 185 km.) is the only paved highway in Kordofan, an area the size of California. Road traffic

moves on a system of non-permanent tracks created over the years by trucks. These tracks run on natural ground, and there is little improvement or maintenance. When a track deteriorates, truck drivers abandon the original route and create a new one. Often, several parallel tracks are available; drivers shift from one to another in an effort to reduce travel time and costs. In northern Kordofan the tracks are sandy and difficult to traverse during the dry season because of the lack of cohesion. Further south, many creek beds (khors) interrupt the dirt tracks and make transit impossible during the wet season and difficult at other times. Flash floods through the khors have washed away seven-ton trucks, and the clay soil acts like glue during the wet season. Truck drivers in some areas must replace their differentials and transmissions twice a year due to road conditions. The system creates a situation where the transportation of goods is slow, costly and, at certain times, practically impossible.

Despite the poor road system, there are numerous small trucking companies with fleets of one to five souk lorries (5-ton trucks) operating within Kordofan Region. These companies go almost anywhere to transport crops from farms to market centers and also deliver goods long distances between market centers. Charges are usually around 70 piasters (37 cents) per ton/km* for farm to market services and 20 piasters (11 cents) per ton/km for longer distances on good roads (i.e. El Obeid-Kadugli). However, the tracks running eastward from El Obeid to Kosti are in such bad condition that charges for long distance hauling are closer to the farm-to-market rate. In addition, transport operators augment their revenues by taking passengers who travel on top of the loads.

While the rates charged by trucking companies appear high, studies of operating costs indicate that they accurately reflect the extremely difficult conditions on the rudimentary tracks in the west as well as the high cost of fuel, which is often available only on the black market. The provision of transport services is a highly competitive economic activity in western Sudan, and there is no evidence that the high transportation charges are a result of monopolistic practices.

In sharp contrast with the lack of an all-weather road network in the western region is the modern paved road network and trucking industry in eastern and central Sudan. This network now connects Khartoum and parts of the modern irrigated area between the Blue and White Niles with Port Sudan

* Calculated at US\$1.00 = LS 1.9 This rate was used instead of the official rate of \$1=LS1.3 in order to reflect accurately the real exchange rate prevailing in November, 1983. Although the free market rate has now climbed to \$1-LS2.3, the figures have not been changed since the local cost of transport has not been re-estimated. It is assumed that the Sudanese Pound cost has risen since November 1983 and that the equivalent U.S. Dollar costs at the prevailing exchange rates are still approximately 37 cents and 11 cents.

and, consequently, international markets. This network allows the efficient shipping of agricultural products, but it extends only to Kosti, thereby effectively cutting off the rainfed agriculture sector of western Sudan.

D. Logframe Narrative

The goals of this project are to increase production in the rainfed agricultural sector of western Sudan, to increase incomes to producers as a direct result of decreased transport costs and better access to markets, and to increase Sudan's export earnings.

The project purpose is to provide and maintain an efficient, all-weather marketing link between the agricultural areas of western Sudan and national and international markets via Kosti, Khartoum and Port Sudan.

The critical link between project goals and purpose is that improved transportation, resulting in lower transport costs, will translate into increased income for agricultural producers. This in turn will provide an incentive for agricultural producers to increase production as well as a marketable surplus. Improved access will also stimulate the increased sale of agricultural surpluses and stimulate a more reliable source of agricultural inputs such as implements, fuel, seeds and fertilizers.

Several studies suggest that improved road conditions will lower transport costs by reducing the time needed for travel and the difficulty of conditions, enabling the greater use of heavier, more fuel efficient transport vehicles, and encouraging competition among trucking firms. A competitive trucking industry already exists in Sudan, plying the route the proposed road will take. At present, transportation costs account for a relatively large proportion of the retail price of agricultural commodities from Kordofan, mainly because of high operating and maintenance costs for vehicles.

Improved road access will lower these costs as well as provide a reliable marketing link which can be travelled throughout the year. The Louis Berger study of November 1983 estimated that the overall cultivable area will be enlarged once the road is improved due to transport savings being passed on to farmers. The incremental increases in transport savings are based on the percent of savings that will be passed on to farmers. In the case of groundnuts, this amounts to approximately 12%, while for sesame and cotton the transferred savings are approximately 6% of total cost reductions. The potential percentage of total transport savings passed to producers are related to the total area in production and the degree of competition in the transport industry, assuming both short- and long-term transport supply elasticities. The Berger report suggests that in the short term (1 to 4 years) less than half of the transport cost savings will be passed on to farmers. But in the medium term (5-9 years) the full transport savings should reach them. Finally, in the long term, foodgrain cultivators will diversify into exportable cash crops.

AID-assessed road projects have shown that better access between farm and market has resulted in substantial increases in farmgate prices and greater

profits if the farmer transports his crop to market himself. Farmers have also paid lower prices for inputs such as fertilizer and other chemicals, and often had more buyers of agricultural products coming to the farm gate. One recently completed study of the Southern Access Road showed, for example, that livestock producers along this route (connecting southern Sudan with Kenya) now receive higher prices for their cattle. Provided the transport industry is competitive, constructing new roads in areas dominated by the rural poor has increased the chances of raising incomes and improving living standards. When complementary services are offered, such as agricultural extension and credit, the poor partake more fully of potential benefits offered by improved roads.*

A second link between goals and purpose is that farmers, with a cheaper and more reliable outlet for their produce, will increase production and be more willing to enter the commercial market. The basic assumption is that increased profits will create an incentive to produce more. Economic assessments conducted by AID-financed consultants give credible support to this assumption. New road projects have been followed by substantial and sometimes dramatic increases in agricultural production, especially where agricultural extension and transport services were available. New roads in Thailand and Honduras resulted in significant changes in farm financing and technology. These consisted of increased use of credit, new seed varieties and, in some cases, mechanized farm equipment. Improved road access stimulated both visits by farmers to local markets and visits by buyers to the farm gate.

It should be noted that in all of these evaluations the host country's trucking industry enjoyed open competition. This is currently the case in Sudan and indeed is the third important link from purpose to goals. Both intercity freight and road passenger vehicles are owned and operated largely by private companies. Since 1973, the number of commercial trucks has expanded rapidly. In addition to the sharp increase in the number of freight-carrying vehicles in Sudan over the past decade, there has also been a noticeable change in the size of trucks. More and more large-size vehicles are being added to the trucking fleet, indicating a healthy and competitive industry taking advantage of economies of scale.

In 1970, 62% of all freight-carrying vehicles were owned by private companies and individuals and 38% by GOS agencies. By 1977, the proportion of private freight-carrying vehicles had increased to 69% and correspondingly that of the public sector had decreased to 31%. In 1979, the respective shares were 71% and 29%. Except for a few large companies, the majority of investors are small businessmen, usually owning fleets of 5 vehicles or less.

Finally, the project assumes that fuel and spare parts will not be a constraint to increasing truck haulage. While petroleum availability has been a continuing problem in Sudan over the past few years, recent developments give reason for optimism regarding future supply. USAID recently initiated a Petroleum Initiative Commodity Import Program which will help guarantee

* Rural Roads Evaluation Summary Report, March 1982, AID.

financing of petroleum imports. The Petroleum Initiative will also serve as leverage for acquiring additional financing for petroleum imports from private oil marketing companies as well as from other donors and the GOS. As part of a policy reform package accompanying the financial assistance, the GOS will undertake a study to deregulate the price of diesel, which is the major fuel in the rainfed agricultural sector for both transport and mechanized farm operations.

Judging from the activity of the private sector in Khartoum's industrial area where most major truck repairs are done, the availability of spare parts for the trucking industry is not a serious constraint to the continued operation of the transport sector. Importation of spare parts for all types of vehicles increased greatly from 1974 to 1979, although proportionately the share of the value of spare parts in road vehicle imports decreased during that time. This, according to a study by the Ministry of Finance and Economic Planning, was primarily the result of the increased availability of better roads which has reduced the need for spare parts.

The proposed linkages between project purpose and goals are completely reasonable when viewed against USAID's agricultural strategy, the importance of Kordofan in Sudan's agricultural sector and USAID's project portfolio in the west. Since 1978, the Western Sudan Agricultural Research Project has provided a strong impetus in the west for increased crop production and better marketing. Similarly, the Kordofan Rainfed Agriculture Project, being designed during FY 84, will address the constraints of feeder roads, crop storage and seasonal cash flow, which presently stifle efficient agricultural production in the west. In addition, the Agricultural Planning and Statistics Project is providing technical assistance to the Ministry of Agriculture in an effort to implement policy changes on consumer and producer prices for all agricultural products. Higher producer prices will increase profits and encourage greater production. Increased consumer prices for wheat will stimulate demand for its closest substitute, domestically produced sorghum. Finally, beginning in FY 1984 USAID is using a portion of the annual Commodity Import Program to import agricultural inputs for private sector enduse in the rainfed sector. A significant share will most likely go to private producers in the Kordofan Region. Taken together, these USAID projects present a complementary package of development interventions for the agricultural sector which will lead to greater private initiative and production in the west.

III. Project Description and Components

A. Project Description

The project consists of constructing and providing maintenance for an all-weather road from Kostî through Umm Ruwaba to El Obeid, a total distance of 301 km. The road will be constructed as a 7.0 meter-wide, two-lane roadway with 1.5 meter shoulders and a double bituminous surface treatment. The construction standards follow the AASHO design approach for secondary roads.

The project evolved over several years. The Kostî - El Obeid road was included in the two major transport master plan studies undertaken in Sudan, by Lockheed (1966) and the Association for the Development of Arab Resources, Inc. (1974). The Berger highway system plan (1973) also ranked this project road and recommended its implementation. From a project perspective, this road has been extensively studied during the past five years. NORCONSULT, a Norwegian consultancy firm, studied the Kostî - Umm Ruwaba section of the project and established its feasibility in a report published in 1978. This report was followed in 1981 by detailed engineering and design work, again by NORCONSULT. In the final design documents, NORCONSULT split this section into two parts for tender purposes: Kostî-Tendelti (90 Km) and Tendelti - Umm Ruwaba (76 Km), for a total of 166 km.

In 1978, the Japan International Cooperation Agency (JICA) prepared the feasibility study, together with the preliminary engineering of the optimal alignment, for the second section of the road, Umm Ruwaba - El Obeid. To select the optimal alignment, JICA analyzed five alternatives along the Umm Ruwaba - El Obeid corridor. Four of the five alternative routes intercept the town of El Rahad, while the fifth goes directly from Umm Ruwaba to El Obeid. The possibility of constructing a secondary road to link El Rahad to the direct route was also investigated. Based on cost benefit analyses, JICA, after carefully evaluating all the alternatives, determined that the optimal route was from Umm Ruwaba through El Rahad to El Obeid, a distance of 135 km. This was later incorporated in the work of Dar Al Handasah, a Lebanese Consulting Firm, which in 1982 developed detailed engineering plans, final design proposals and tender documents .

In November 1983, Louis Berger International, Inc., under an AID contract, reappraised the project road with the aim of:

1. up-dating data pertaining to vehicle operating cost savings and other benefits identified by the two earlier feasibility studies;
2. estimating the potential agricultural benefits attributable to the road; and
3. reassessing the design standard and construction costs in light of cost escalations.

After fully investigating the elements of the road, Berger developed a set of recommendations for the design standards and tender documents. This PP has evolved along Berger's recommendations.

The entire project from Kosti to El Obeid (301 km) requires financing well beyond the equivalent of \$100 million. Because of this, the GOS requested support from both the African Development Bank (ADB) and USAID. Combining funds from both these sources, and using local currency generated by the PL 480 Title III Program, a financing package was put together for the PID which included \$38.448 million from the ADB, \$2.770 million from the Norwegian Government through the ADB, \$47.100 million from USAID, and the equivalent of \$29.5 million in local currency from the GOS. The financing package and elements of the technical approach have subsequently changed and are explained in Section IV, Cost Estimate and Financial Plan.

The project was presented in the PID with the foreign exchange requirements of the Kosti Umm Ruwaba section coming from the ADB, the Norwegian government and USAID. The foreign exchange requirements of the section from Umm Ruwaba to El Obeid were to be financed solely by USAID. During the Project Paper preparation it was decided that joint financing of the first section presented serious operational and administrative problems, particularly with respect to source and origin of contractors, commodity procurement and contracting regulations. The ADB concurred with USAID that implementation would be smoother if both donors independently finance separate sections. For reasons stated in Section IV below, the ADB's funds are not sufficient to finance the entire first section of 166 kms. Therefore, it is proposed that the ADB finance a first section of reduced length from Kosti to the Tendelti area, a distance of 116 kms, and AID finance the second section from the Tendelti area to El Obeid, 185 kms. Both sections are of the same standard and through similar terrain. Construction can proceed simultaneously since traffic presently cuts its own track along the entire route. The narrative on the implementation actions and schedule in this Project Paper relates only to the second section, to be financed by USAID. Conditions and covenants in both the USAID and ADB project agreements will link together construction on both sections of road. The overall schedule for the first section, financed by the ADB, is shown on the flowchart in Section V. A. 1.

B. Project Components

1. Contracting

Three major activities are required for successful implementation of the project: (1) engineering services to prepare the IFB package and construction supervision; (2) construction services to build the roadway and related facilities; and (3) a road maintenance program following completion of construction which will require an input from both the engineering consultant and construction contractor.

The engineering services contract will be a host country contract with a U.S. engineering firm.

The construction contract will be a host country contract with a U.S.

firm selected through prequalification procedures. The decision to utilize host country contracting for engineering and construction services was based primarily on the experience and capabilities of the RBPC. To strengthen RBPC's contracting capability on difficult cost reimbursement contracts for A and E services, USAID will provide short-term technical assistance.

The design work and contract documents for both sections of the road were prepared by non-U.S. engineering firms. They will be modified to conform to AID regulations and U.S. contract terminology. In addition, the engineering services firm must deal with U.S. and AID regulations throughout the project life. Since U.S. engineering firms could best perform these services, it was decided to limit the engineering services contract to U.S. companies.

Consideration was given to the use of a contract management firm or qualified individual to assist the RBPC in administering the construction contract. While these options might assist the RBPC and give USAID a more direct link to the project, they were rejected for the following reasons: (1) a contract management firm would dilute the responsibilities of the engineering services consultant;

and (2)

this option would involve unnecessary expense.

USAID considered the possibility of small, minority enterprises providing some of the services that will be required to implement the project. Both the engineering services and the construction contracts will be large contracts by any standard. In both cases they will require extensive home office support and backstopping. In addition to personnel recruiting and logistical support, the home office will necessarily need a strong financial base. On the technical side the home offices of both will need to maintain, furnish and provide technical design and construction cost data, all of which assumes the availability of a technically qualified staff and access to modern data processing computers.

The firm to furnish the engineering service will be selected on the basis of experience and the ability to furnish qualified personnel and provide full home office backstopping. The construction contractor will be selected on the basis of experience in constructing similar road projects and the financial ability to field and support a large construction effort in a foreign country. These firms must have access to considerable financing and bonding.

In both cases, it appears that small, minority enterprises may not have the experience or capability to launch an operation of the magnitude required. However, the prime contractors may chose to subcontract to a small,

minority enterprise. It would be acceptable for the consultant or the contractor to subcontract while retaining monitoring responsibility, but it would not be conducive to implementation for USAID to divide the responsibilities for engineering services or construction into smaller units for the purpose of letting several small contracts rather than two major contracts, as now planned.

USAID concludes that the use of small, minority firms for the implementation of this project is not feasible.

2. Engineering Services

RBPC will execute a host country contract with a U.S. engineering firm to perform the usual functions of an A and E. Prepare the final design and IFB documents based on the original designs, assist the implementing agency and USAID in the bid evaluations, and ultimately supervise the construction of the road. The engineering firm will furnish the construction site supervision team which will consist of a resident engineer on the construction site for 65 person-months plus a construction engineer and laboratory engineer for 45 months each. The engineering firm will furnish short-term engineers and specialists, as needed. A detailed scope of work for the engineering services was prepared for the draft PIO/T, which is available in USAID/Sudan.

3. Construction Services

Construction services will be executed through a host country contract between the RBPC and the selected construction contractor. A prequalified short list of U.S. construction firms will be developed, using the services of the engineering firm to assist in the contractor prequalification and preparation of recommendations for USAID and RBPC approval. As now scheduled, the IFB package will be available to prequalified contractors in October 1985, with the award of contract planned for March 1986. Construction, including a six month mobilization period, will take place over 50 calendar months. Completed sections of road will require a one year maintenance period under the construction contract prior to final acceptance by the RBPC. All construction and maintenance responsibilities of the contractor are expected to be completed by April 1991.

4. Maintenance Component

Maintenance has been an essential part of the project development process, beginning with the Berger study. This interest has been complemented by a major project effort by the World Bank and the RBPC to upgrade the RBPC's maintenance capabilities through the Third Highway Project, beginning in September 1984. Its implementation coincides with the construction of the Kosti-El Obeid road. USAID has had the benefit of the analyses that went into the Third Highway Project and developed a maintenance program for the Kosti-El Obeid road that complements the planned outputs of the Third Highway Project and provides for potential shortcomings.

Maintenance of all paved roads in Sudan (2,245 km) is the responsibility of the Maintenance Directorate of the RBPC. The Directorate is organized into six regions, each divided into two or more districts supervised by district engineers. The present maintenance structure is satisfactory from an organizational standpoint and is based upon recommendations made by Louis Berger International, Inc., in a 1979 study financed under the First Highway Project. The Directorate has a professional staff of 21 engineers and 29 technicians. The incumbent director has held his present position since 1974. He is a graduate engineer and has had advanced training in England and the U.S. The six regional engineers are all senior engineers and have at least fifteen years of experience in road construction and maintenance.

Until recently, road maintenance had not received the attention or financing required to maintain a paved road system adequately. As was pointed out in the PID, the paved road network is relatively new, with 70% of all paved roads constructed during the past decade. Because of this, maintenance of paved roads has not yet been a serious problem. However, due to weathering and heavy traffic some sections of paved road are now in need of overlays. Without these overlays the roads will deteriorate rapidly. Noticeable deterioration is now taking place on two sections of the Khartoum to Port Sudan road. While this lack of maintenance is at least partially attributable to shortages of funds, it is also due to a dearth of experienced personnel and sufficient equipment.

Unaware of the scope of the World Bank Third Highway Program, the Berger study recommended that a maintenance program be financed under the project. The program developed under their study provided resources necessary to maintain the Kost-i-El Obeid road and would be implemented by the RBPC following completion of construction. It consisted of two elements, routine and periodic maintenance. Routine maintenance is carried out continuously or at least once a year on and along the roadway. Activities include vegetation control, road signs, kilometer markers, drainage structure repair, shoulder and sideslope maintenance, and surface patching of the carriageway. Periodic maintenance involves those activities which are carried out once every five or more years on the roadway and include asphalt overlays, surface seal coats, and shoulder sealing.

The study made a detailed analysis of maintenance costs and projected them out to the year 2007. However, the Berger study did not take into consideration the potential development in maintenance capabilities and of financing of maintenance that may take place under its Third Highway Project. The Berger study recommended that the maintenance organization and facilities, including technical assistance, be financed by the road construction financing agencies. The program included the initial plant and equipment, materials, workshops, housing, offices, laboratories and technical assistance. A maintenance organization and staffing structure was recommended, with the Kost-i-Umm Ruwaba section operating under the Sennar District maintenance engineer and the Umm Ruwaba-El Obeid section under the Dilling District maintenance engineer. Excluding the potential of the Third Highway Project, the maintenance program recommended by Berger was reasonable. There were and currently are no facilities or organization for maintenance between Kost-i and El Obeid for the obvious reason that no road exists.

The World Bank and the GOS have recently concluded negotiations for the Third Highway Project and the scope of the project has led USAID to revise the maintenance program proposed by Berger. The focus of the project is to strengthen the RBPC's institutional and administrative capabilities in road maintenance through training, commodities and technical assistance to the RBPC. It is a \$17.1 million project scheduled to begin in September 1984 and will be implemented over a four year period. Its implementation coincides with the construction of the Western Agricultural Marketing Road Project and will complement this project by strengthening road maintenance capabilities throughout the interconnecting road network. Upon completion of the Kost-El Obeid road, the RBPC should have the institutional capability to maintain the national paved road system.

Among other elements, the Third Highway Project will provide assistance to the RBPC for:

- Technical assistance to improve workshop organization and management, spare parts management, and equipment rehabilitation; strengthen planning and road maintenance capability; and implement the road maintenance programs of the respective agencies.
- Training to strengthen the RBPC training directorate by establishing a mobile Training Production Unit, procuring equipment for technician training at the Khartoum Polytechnic, instituting a three-year apprenticeship scheme for master mechanics and electricians, and organizing seminars for professional staff.
- Procurement of workshop tools and equipment, road maintenance equipment and spares, and limited provisions for fuel and bitumen.

The World Bank and the GOS have agreed upon several key implementation actions and target dates that should have considerable effect on the development and effectiveness of RBPC road maintenance:

- A highway organization and investment study will be made to review the existing role and organization of the RBPC, define its future role and functions and recommend improvements in its organization taking into account available staff at various levels. The GOS has agreed that following the above study it would adopt a plan satisfactory to the World Bank to reorganize the RBPC and that it would complete implementation of the plan not later than June 30, 1987.
- The highway organization and investment study will also review the current laws and regulations pertaining to control of vehicle dimensions and weight and those governing vehicle imports and

recommend necessary amendments including enforcement procedures and measures. The GOS has agreed, following the study, to adopt a plan agreeable to the Bank for implementing the recommended regulations no later than January 1, 1987.

- The GOS has agreed that each year, starting in 1984, it will prepare a highway investment program for the following three years and by October 31 review and agree upon the program's implementation with the Bank.
- The GOS and the Bank have agreed that no later than July 1, 1986, a revised format of annual estimates of RBPC expenditures will be prepared to show road maintenance works to be executed and corresponding allocation of funds.

The composition of the maintenance component for the Project Paper was influenced and determined by several factors:

- (1) A review of the Third Highway Project indicated that there should be considerable improvement in RBPC maintenance capabilities over the next five years, not only in organization and technical ability but also in budgeting and arrangements for allocating funds.
- (2) The construction contractor will be responsible for maintenance for one year after completion of construction.
- (3) The project road will need little other than routine maintenance for two years after construction, or not until May 1992.
- (4) Since the RBPC is organized on a geographic basis, it would not be practical to finance workshops, equipment and technical assistance to be used exclusively on 300 km of road. The facilities and technical assistance would be greatly underutilized.
- (5) It was necessary to view the maintenance component on a regional basis. Five to seven years hence, the Kosti-El Obeid road will be part of a regional maintenance program and will probably include the road from Kosti through Umm Ruwaba, El Obeid and Dubeibat to Kadugli, plus any other roads assigned to the RBPC .

After discussions with the RBPC, it was decided that the maintenance component be handled under this project as follows:

- (1) The construction contractor will be required to build his construction camp at Umm Ruwaba to such a standard that it will serve after construction as a permanent maintenance workshop. He will also build a less elaborate camp at El Rahad which will serve as a maintenance facility but will not have a fully equipped workshop.
- (2) Funds will be reserved to upgrade the Dutch construction camp at El Obeid on the El Obeid-Dubeibat road to a fully equipped RBPC maintenance workshop
- (3) The construction contractor will, as part of his construction contract, be required to stockpile at the maintenance centers pipe, asphalt cutback, and aggregates for maintenance use on the Kosti-El Obeid road.
- (4) At mid-point in the construction period, the engineering consultant will be required to study regional maintenance needs. This study will consider the development of RBPC capabilities under the World Bank Third Highway Project, the status of toll collections and progress by the RBPC in identifying other road user charges for maintenance. The RBPC's plans for regional maintenance from Sennar to Kadugli and the particular maintenance needs of the Kosti-El Obeid road will be examined. Sufficient funds are programmed under the engineering for the study as well as for the procurement of equipment and two person-years of technical assistance: \$660,000 for equipment and \$340,000 for technical assistance. An illustrative list of the equipment that may be purchased is listed in Annex 6A.* Part of the maintenance study will be an evaluation of the feasibility of purchasing used and rehabilitated construction contractors' equipment rather than purchasing new equipment. The study will be made in mid-1988. The equipment will be ordered in sufficient time to be on the project site when the technical assistance advisors arrive. They are scheduled to be on the site before the construction contractor departs. If the study recommends a longer maintenance program or a phase II program, it would be the subject of a subsequent project.

In summary:

- (1) The construction contractor will build his construction camp at Umm Ruwaba and El Rahad to such a standard that after construction of the road it can be used as a maintenance facility. The project's foreign exchange budget provides \$500,000 for the Umm Ruwaba facility and \$300,000 for the El Rahad facility, in addition to whatever amount is included in the construction contractor's mobilization costs.
- (2) \$200,000 are budgeted to upgrade the Dutch construction camp at El Obeid on the El Obeid-Dubeibat road to a fully equipped RBPC maintenance workshop. This will be done under the construction contract.

*All maintenance equipment purchased by the engineering consultant will be used by the GOS for its ongoing maintenance program and not by the

- (3) \$500,000 is budgeted under the construction contract to stockpile maintenance materials at Umm Ruwaba, El Rahad and El Obeid. This will be done by the construction contractor before he leaves the construction site.
- (4) \$120,000 is budgeted under the engineering services contract to finance a maintenance study to be conducted by the engineering consultant at midpoint in construction, or approximately mid-1988.
- (5) \$660,000 is budgeted to purchase the maintenance equipment identified as necessary in the maintenance study mentioned in the paragraph above.
- (6) \$340,000 is budgeted to finance two person years of technical assistance that may be identified as necessary in the maintenance study.

5. Maintenance of the Connecting Road Network

If the projected economic benefits of the project road from El Obeid to Kosti are to be realized, then the road connecting Port Sudan, Khartoum and Kosti must be maintained since this is the primary route of export production.

Technical assistance under the Third Highway Project includes a transportation economist and a cost accountant. These experts will assist the RBPC in, among other things, establishing an annual road maintenance program and budget. In an effort to establish budgetary requirements for the road network accurately, the World Bank and RBPC will meet annually in October, beginning in 1984, to review the annual maintenance program. The annual budget and physical targets of road maintenance will be subject to World Bank review and approval. The Bank has assurances from the GOS that funds will be released to RBPC in line with the budget requirements and program agreed to with the Bank.

The funding needs for the connecting road network connecting to Kosti are as follows:

	Maintenance Funds Required(*) (Millions)			
	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>
<u>Kosti/Port Sudan (1242 km)</u>				
Routine Maintenance and Patching	1.9	2.0	2.1	2.2
Resealing	10.3	8.2	20.0	5.0
<u>Khartoum/Wad Medani (191 km)</u>				
Routine Maintenance and Patching	<u>.4</u>	<u>.5</u>	<u>.6</u>	<u>.7</u>
Total Requirements	12.6	10.7	22.7	7.9
Available from tolls (**)	<u>1.8</u>	<u>2.0</u>	<u>2.2</u>	<u>2.4</u>
Shortfall (to be provided)	10.8	8.7	20.5	5.5

The funding shortfalls will be the major topic during the World Bank's annual meetings with the GOS. Under the Third Highway Project Agreement, the GOS must meet this shortfall each year, although mechanisms are not specified.

USAID will also meet annually with the GOS and IBRD consultants subsequent to the World Bank meetings in order to review progress on financing recurrent costs for maintenance. Tolls charged on the Kosti-El Obeid road will cover routine maintenance costs (see annex 8), but financing of costs must be more extensive to ensure a functioning road network throughout Sudan. If annual meetings with the GOS are insufficient to secure adequate financing, USAID will work directly with the World Bank to explore alternative means to collect road user fees efficiently. The Bank is confident, however, that it has structured its agreement on the Third Highway Project in a way that allows maximum flexibility on financing alternatives while securing a firm GOS commitment to provide funds on a consistent basis. Given the extent and level of expertise provided through the World Bank project, USAID will concentrate its initial efforts on supporting and reinforcing IBRD measures to assure GOS financing of road maintenance costs beyond the life of the project.

* Source RBPC/World Bank Staff Appraisal Report, February 6, 1984.
 ** Estimates are based upon current tolls being doubled

IV. Cost Estimate and Financial Plan

A. Introduction

As stated earlier, for the purpose of cost estimates and implementation, the PID originally described the project as consisting of the construction of two road sections. The first section, from Kosti to Umm Ruwaba (166 km), was to be financed jointly by ADB, USAID and NORAD, and the second section was to be financed solely by AID. However, after further analysis and discussions with both the GOS and ADB, these financing arrangements were modified for reasons stated in Section III A. above, so that each donor would finance discrete sections of the road.

In addition, during the project paper preparation, technical questions were raised regarding the use of cement treated base courses construction proposed for the first section. A study was initiated to compare the technical merits of a cement stabilized base versus the use of a crushed stone base. As a result of this study (See Annex 6-A), it was decided that the design proposed - to use a cement stabilized base - would not be practical for Sudan, and therefore the more expensive method of base construction, using a crushed stone base and sub-base, would be used. This results in longer hauls and additional handling of aggregate and a cost increase of \$5.0 million in foreign exchange and local currency.

Given that the ADB's cost estimates were based on the use of the less expensive cement stabilizing of bases, it became obvious that the ADB foreign exchange contribution being a fixed amount of \$38.448 million plus \$2.770 million from NORAD would be insufficient. In order to maintain the integrity of the project, it was necessary to reduce the length of the segment financed by the ADB and increase the segment financed by AID, since there is more flexibility regarding AID financing. By increasing AID's segment, a chain reaction of cost increases followed: the engineering cost to prepare the IFB needed to be increased, the construction period had to be lengthened a year and the construction mid-point for consideration of inflation had to be extended an additional year. Furthermore, the construction contractor will now have to be on the site a year longer, which also resulted in increased engineering services. All of these factors translated into an additional 13% increase in total project cost. On this basis, a new financial and technical analysis indicates that the ADB will have funds sufficient only to finance 116 km at the higher cost, leaving a balance of 185 km for AID to finance. The total project cost has increased by 21%, over that stated in the PID.

All cost figures start with the October 1983 base figures stated in the Economic Reappraisal of the Kosti-El Obeid Road done by Louis Berger International, Inc. The costs are then increased by introducing an inflation factor of 7 1/2 % per year for the foreign exchange portion and 25% per year for the local currency plus 10% for contingency (See Annex 6-C). The construction cost mid-point for the first section (116 km) was taken as mid-1987 and for the second section (185 km) as mid-1988. NORAD will finance the engineering services for the first section to be furnished by NORCONSULT

at an estimated cost of \$2.770 Million in foreign exchange plus \$.900 Million in local currency. The construction costs for the first section are estimated at \$38.5 million in foreign exchange and \$15.1 million in local currencies. The engineering service for the second section, to be furnished a U.S. firm, is estimated to cost \$4.9 million in foreign exchange and \$6.75 million in local currency. The construction costs for the second section are estimated to be \$51.9 million in foreign exchange and \$21.9 million in local currency. The maintenance component is estimated to cost \$2.6 million in foreign exchange and \$.9 million in local currency.

B. Estimated Costs

1. Section 1 - Kosti to Tendelti area 116 km

	<u>FX in \$000</u>	<u>LS in \$000</u>	<u>Total \$000</u>
Construction Services	38,500 ^{1/}	15,100	53,600
Engineering Services	2,770 ^{2/}	900	3,670
Totals	\$ 41,270	LS \$ 16,000	\$ 57,270

2. Section 2 - Tendelti area to El Obeid - 185 km

Construction Services	51,900	21,900	73,800
Engineering Services	4,910	675	5,585
Totals	56,810	LS \$ 22,575	\$ 79,385

3. Maintenance - Entire road

Under the construction services	1,500	600	2,100
Under the engineering services	1,130	310	1,440
Totals	\$ 2,630	LS \$ 910	\$ 3,540

4. Total AID cost

\$ 59,440

Use

\$ 60,000^{3/}

5. RBPC Salaries

1,500 1,500

6. Audits

40 40

7. Total Project Cost

\$ 101,270 LS \$ 41,025 \$ 142,270

Use

\$ 102,000 LS \$ 41,000^{4/} \$ 143,000

^{1/} ADB contribution \$38.500 million

^{2/} NORAD contribution \$2.770 million

^{3/} AID contribution \$60.000 million

^{4/} GOS contribution primarily from PL 480 Title III or CIP generated local currency - \$41.000 million.

C. Methods of Implementation and Financing

The following table and notes are presented in response to the Administrator's approval of sixteen Payment Verification Policy Statements:

<u>Method of Implementation \$'s</u>	<u>Method of Financing</u>	<u>Approximate amount</u>
Host Country Contract for Engineering Services.	Direct L/Comm for FX payment by AID	\$ 5.1 million
Construction Contract HC Institution.	Direct Letter of Commitment. ^{3/}	\$52.0 million
Commodities by Engineering Firm.	Bank L/COM. ^{4/}	\$.6 million
Total		\$58.7 million
Engineering Firm Support Local Currency Costs. ^{1/}	Direct Pay.	LS \$.700* million
Local Currency Cons- truction Costs. ^{1/}	Direct Pay.	LS \$22.000* million
Total		LS \$22.7* million =====

* Local currency costs converted to dollars (\$1.00 = LS 1.3)

1/ Funds from the Government of Sudan special account will be transferred to the RBPC, which will account for all disbursements. The account will be audited annually.

3/ The justification for the direct L/COM is that the Roads and Bridges Public Corporation does not have funds to pay the construction contractor and seek reimbursement from USAID. Therefore, USAID is approving a direct letter of commitment to the contractor.

4/ The RBPC does not have the capability to effectively carry out procurement of maintenance equipment following AID procurement regulations without considerable assistance. Therefore, the engineering consultant will be required to do these procurements. USAID believes that the bank L/COM method of payment will be the most cost effective and will be in the best interest of the U.S. Government.

D. Payment of Invoices and Audits

1. Foreign Exchange

(a) Engineering Services Contract

The engineering services contract will be a host country contract between the selected engineering firm and RBPC. Upon execution of the contract, USAID will issue a Direct Letter of Commitment to the A and E firm. The engineering consultant will submit invoices to the USAID Engineering Office through RBPC for review and certification. The USAID Engineering Officer will review and certify the invoices and pass them to the controller's office for processing payment through the regional disbursing office. As is customary, the contract will stipulate that if for any reason payment is held up by the GOS, USAID will be authorized to make payment 45 days after the invoice date.

(b) Construction Contract

The construction contract will be a host country contract between the selected contractor and the RBPC. Upon execution of the contract USAID will issue a Direct Letter of Commitment to the contractor. The contractor will submit invoices to the USAID Engineering Office through the engineering consultant and the RBPC for review and certification. The USAID Engineering Officer will review and certify the invoices and pass them to the Controller's Office for processing payment through the Regional Disbursing Office. As is customary, the contract will stipulate that if for any reason payment is held up by the GOS, USAID will be authorized to make payment 45 days after the invoice date. There should be no delay with RBPC since the RBPC will be authorized to certify invoices. Payment will be made through a Direct Letter of Commitment because the GOS does not have the resources to make payment and seek reimbursement.

(c) Equipment Procurement

If the engineering consultant is required to make relatively large value procurements (for example, maintenance equipment), the consultant, upon USAID approval of the equipment list, will make the procurement following AID regulations and request AID to open a U.S. Bank Letter of Commitment. Payment will be executed through a Letter of Credit issued from the Letter of Commitment bank in favor of the specific supplier. Relatively small value procurements will be made by the contractor's office, and paid invoices submitted along with the contractor's regular monthly invoice for reimbursement. All maintenance equipment purchased by the A and E firm will be for the GOS ongoing maintenance program and not for the Construction contractor's use.

2. Local Currency

The engineering consultant and the construction contractor's, etc. The construction contractor's local currency invoices will be submitted to the RBPC through the engineering consultant for review and certification. Payment will be made by the RBPC from funds deposited in a special bank account for RBPC project account funds. The RBPC has sufficient staff and technical ability to account for these funds adequately.

3. Audits

Annually, during the project life beginning in March 1986, USAID will contract with a local accounting firm to audit the dollar and local currency accounts under the project of the engineering consultant, the construction contractor, and the RBPC. The scope of work and contract for the local accounting firm will be approved by the U.S. Auditor General's staff in Nairobi and the audit findings will be reviewed by the same office. The Auditor General's staff in Nairobi will also ensure that the local audit firm fulfills the qualification requirements for non-federal auditors for audits of AID-financed contracts. Two man-months are budgeted for each annual audit with funds provided by CIP local currency generation.

E. Recurring Costs

Maintenance of the road after completion will require an annual budget and allocation of funds. The Berger study attempted to identify the maintenance cost associated with the 301 km road. These cost figures are stated and discussed in Annex 8 in relation to toll collections. The planning and funding of road maintenance are subjects covered by the World Bank Third Highway Project (described above in Section III. B. 3). It is anticipated that over the next five years the GOS and the RBPC will implement a procedure by which all road maintenance costs will be assured on an annual basis. The PP team concludes that this project will not place an unmanageable burden on the GOS.

F. Project obligations in relation to USAID OYB

The following table depicts project disbursements and obligations in relation to USAID's future program. It illustrates that although the total LOP authorization level is quite large, it represents just 25 percent of the OYB development assistance levels for the Sudan during the life of the project. All other new starts proposed within the context of the CDSS and ABS can be accommodated. The current obligation plan allows the Mission four new starts in FY 1985, with the flexibility to delay at least one of those to FY 1986. In FY 1987, USAID will be ready to initiate new projects based on considerations of needed assistance. The proposed OYB levels coincide with the planning levels presented in the FY 1986 ABS.

The key substantive issues on how financing the road will affect the project portfolio are 1) whether the obligation plan overly skews the OYB to the ARDN account, and 2) whether the Mission will have adequate flexibility in its agriculture program. In both cases the proposed funding levels do not

Analysis of Disbursements and Obligations
(\$Millions)

	<u>FY 84</u>	<u>FY 85</u>	<u>FY 86</u>	<u>FY 87</u>	<u>FY 88</u>	<u>FY 89</u>	<u>FY 90</u>	<u>Totals</u>
1. Planned Disbursements		1.0	10.0	14.5	18.0	12.0	4.6	60.0
2. Cumulative Required to Meet Disbursements*	1.0	11.0	25.5	43.5	55.5	60.0		60.0
3. Annual Obligation Plan For Road	15.68	16.1	24.6	3.7				
4. Mortgages (existing project not fully funded)	5.1	6.1	2.0	2.1				
5. Other New Projects		11.9	16.0	12.7	36.7			
A. KORAG		(4.5)	(8.0)	(3.0)	(2.6)			18.1
B. River Transport		(3.7)	(4.2)	(2.3)				10.2
C. Macropolicy		(1.0)	(2.0)		(2.0)			5.0
D. CRS		(1.9)	(1.3)					3.2
E. WSARP Amendment				(3.0)	(2.0)			5.0
F. PD&S		(.8)	(.5)	(.8)	(.8)			
G. Other				(3.4)	(31.3)	(42.6)	(46.9)	
6. Total OYB (Based on FY 86 ABS)	20.7	28.0	32.0	35.2	38.7	42.9	46.9	

* Assumes obligations are in place for following year disbursement.

present problems. From 1981 through 1983 the ARDN account absorbed 82 percent of USAID's development assistance OYB, with a peak of 91 percent in FY 1983. That percentage actually declines to an average of 77 percent from 1984 through 1987, the four years over which the road will be obligated. The FY 1986 CDSS update outlines the justification for USAID's focus on agriculture in its development assistance program. Many of these arguments are summarized in the Project Rationale section of the PP.

The effect of the proposed obligation plan on USAID's agriculture program must be evaluated in light of the constraints to agriculture and the mechanisms available to address them. An "Agricultural Strategy Assessment" completed for the Mission in 1982 concluded that the major production constraints were marketing and transport, pricing policies, technology, and environmental degradation. These constraints have been reaffirmed in subsequent studies, particularly analyses focusing on western Sudan. Of these constraints, marketing and transport problems require the greatest amount of foreign exchange for adequate solutions.

In this light, USAID will direct the bulk of its new agriculture projects toward transport and marketing. The Western Agriculture Marketing Road is central to the transport strategy linking the west to national and international markets. The Kordofan Rainfed Agriculture Project addresses marketing and transport constraints within Kordofan Region. The River Transport Marketing Project further integrates the south with markets throughout Sudan. All of these projects have high foreign exchange requirements and will absorb the bulk of development assistance funds through FY 1987.

Other aspects of agriculture, however, are not neglected. USAID's PL 480 programs continue to provide a vehicle for policy dialogue, which up until now has concentrated on consumer and producer pricing policies for food grains. Future programs will include more extensive reform packages that will be linked with policy studies done through the Agricultural Planning and Statistics Project. The Commodity Import Program also has a policy and production thrust supportive of agriculture. The 1984 CIP will set aside \$7 million to finance agricultural inputs for the west and south. Regional support under the CIP will continue in future years, providing a mechanism for resolving technical constraints to production that require foreign exchange input.

The full importance of the CIP and PL 480 programs is realized through local currency generations. Programming of this local currency through cooperation with the Ministry of Finance and Economic Planning has allowed USAID to expand the scope of the agriculture program without draining the foreign exchange budget. The Mission has accelerated the production of improved sorghum, millet and groundnut seeds through local currency funds and information sharing. The seed production and testing programs have been integrated with our research efforts in Kordofan, Darfur, Ekuatoria and the Blue Nile, and together they will have a significant technical impact on production. To give additional support to our marketing efforts, local currency inventory loan programs will be initiated in the principal groundnut producing areas of the west. By making credit available at harvest, farmers

will have greater financial flexibility to respond to market price signals when selling their crops. Environmental degradation due to deforestation can be addressed with local currency support for nurseries and extension services to demonstrate how to intercrop gum arabic trees with food crops.

These activities only illustrate the broad range of issues that are being addressed through the various facets of the agriculture program. In this context, financing for the Kosti-El Obeid road fits logically within the project portfolio. Although costly, the payoffs are extensive and it fills a programmatic gap to support agricultural marketing that cannot be met with local currency and program assistance. Indeed, the road adds to the agriculture program's flexibility by increasing incentives to private producers and complementing the impact of policy reforms, thereby opening new opportunities for local currency activities to support private agriculture and to address secondary production constraints.

V. Implementation Plan

A. Master Plan/Schedule

1. Introduction

Project implementation is scheduled over seven years beginning with the Project Authorization in July 1984 and ending with the departure of the technical advisors on the maintenance component in June 1991. The project PACD is six months later in December 1991.

Pre-construction contract activities, such as preparation of the PIO/T, acquiring engineering services, preparing the IFB package, pre-qualifying potential construction contractors and, finally, negotiating the construction contract consume a considerable portion of the project life. The construction contract is scheduled to be signed in March 1986.

Construction is expected to last from March 1986 to May 1990, or 50 months. The construction contractor is responsible for maintenance of completed segments of road for one year following acceptance by the RBPC. The road will be turned over to the RBPC in 50 km. segments beginning in December 1988. The one year contractor's maintenance responsibility starts after each road segment has been accepted by the RBPC. The contractor's responsibility for maintenance on the last segment ends in April 1991, at which time he departs the project site.

A maintenance program is scheduled to be in place prior to the departure of the construction contractor. The maintenance study described above in Section III. B. 3. will be made in October 1988. The equipment and technical assistance under the maintenance program will be in place in July 1990, and the advisors will depart in June 1991. The construction contractor is scheduled to depart in April 1991.

A baseline survey to measure progress toward the project purpose is scheduled for October 1986 just before construction starts, and again at the mid-construction point, April 1988. The final evaluation of the project purpose is scheduled for May 1990. An evaluation of the project's economic impact is scheduled for four years after completion of the road, i.e. June 1994. An audit by a Sudanese accounting firm is scheduled annually beginning in March 1986. This will be a financial audit of the project accounts involving USAID, the RBPC, the engineering consultant and the construction contractor.

There are two events in the schedule over which AID has no control but upon which the schedule depends. The AID/GOS Project Grant Agreement will be ready for execution in August 1984. In late June the ADB and GOS agreed on a repayment plan for GOS arrears that allowed the ADB to proceed with its appraisal of the project road and will allow an agreement to be signed during the ADB's fiscal year. AID will not sign the Project Agreement until receiving assurances from the ADB of adequate GOS performance on the repayment plan. AID will also not authorize the RBPC to sign the construction contract

for section two before the ADB/GOS are ready to sign a construction contract for section one. The construction contract for section two is scheduled to be signed in March 1986. Since the ADB/GOS have already determined that NORCONSULT will furnish the engineering services, the elapsed time to obtain a construction contractor should be considerably shorter than that required by AID and the GOS on section two. Therefore, the ADB/GOS should have a construction contract prior to March, 1986. These critical events will be addressed in the Project Agreement, Conditions Precedent.

2. Detailed Schedule

Implementation Schedule of Intermediate Events
AID-Financed Section Two

<u>Actions</u>	<u>Date</u>	<u>Responsible Entity</u>	<u>(*) PIL Action</u> <u>(**) Critical Path</u> <u>Event</u>
1. Preparation of draft scope of work for engineering services including the CBD notice requesting pre-qualification questionnaires.	June '84	USAID	
2. PP approved, project authorized.	July '84	USAID/GOS	(**)
3. Project Agreement signed.	Aug. '84	USAID/GOS	
4. CBD notice published requesting engineering services prequalification questionnaires.	Aug. '84	USAID/AID	(*)
5. GOS and ADB sign agreement.	Oct. '84	GOS/ADB	
6. RFTP available at AID/W for prequalified firms.	Nov. '84	USAID/AID/GOS	
7. Initial CP's met for first.	Dec. '84	USAID/GOS	(*) (**)
8. Closing date to receive technical proposals for engineering services, with proposals received at Khartoum.	Jan. '85	USAID/GOS	
9. Selection of first consultant firm for engineering services contract on AID project. RBPC negotiates with top firm.	Feb. '85	USAID/GOS	

10.	RBPC executes engineering services contract. USAID approves.	Feb. '85	USAID	(*)(**)
11.	Prequalification notice published in CBD for construction contractors.	March '85	USAID/GOS	
12.	Engineering service firm mobilized, start design modification, revision of IFB documents.	March '85	GOS/USAID/ Consultant	
13.	Closing date for submission of prequalification data by construction contractors	July '85	USAID/GOS	
14.	Prequalified list of construction contractors approved.	Sept. '85	GOS/USAID	
15.	IFB package completed and approved.	Aug. '85	USAID/GOS/ REDSO	(*)
16.	Award of ADB-financed construction contract for road section one.	Prior to Oct. '85	GOS/ADB	(**)
17.	IFB package to pre-qualified contractors.	Oct. '85	USAID/GOS/ Consultant	
18.	Construction pre-bid conference at Khartoum and site.	Nov. '85	Consultant/ USAID/GOS	
19.	Closing date for construction tendering, open bids.	Dec. '85	Consultant/ USAID/GOS	
20.	Analyze bids, recommend award.	Jan. '86	Consultant	(*)
21.	Award construction contract.	March '86	GOS/USAID	(**)
22.	Consultant's resident engineer on site.	March '86	Consultant	
23.	Project accounts audited.	March '86	USAID	
24.	Mobilization of construction contractor.(6 months)	March '86	Contractor	
25.	Consultant's construction engineer and testing engineer on site.	June '86	Consultant	

26. First project evaluation.	Oct. '86	USAID/REDSO/ GOS	
27. Project accounts audited.	March '87	USAID	
28. Project accounts audited.	March '88	USAID	
29. Second project evaluation.	April '88	USAID/REDSO/ GOS	
30. ADB financed road section one completed (116 km).	July '88	Contractor	
31. Road maintenance study undertaken by consultant.	Oct. '88	Consultant/ USAID	
32. Road maintenance study reviewed.	Dec. '88	USAID/GOS	(*) (**)
33. First 50 km of road accepted	Dec. '88	Consultant/GOS USAID	
34. Project accounts audited.	March '89	USAID	
35. Second 50 km of road accepted	May '89	GOS/Consultant/ USAID	
36. RBPC assumes responsibility for first 50 km.	Nov. '89	GOS/USAID	
37. Third 50 km section accepted. Contractor maintenance on first 50 km ends.	Dec. '89	Consultant/GOS/ USAID/Contractor	
38. Project accounts audited.	March '90	USAID	
39. Final 35 km section accepted. Contractor maintenance on second 50km ends.	May '90	Consultant/GOS/ USAID/Contractor	
40. Final project evaluation.	May '90	USAID/REDSO/ GOS	
41. All construction work completed on road, contractor demobilizes.	June '90	Contractor	
42. Maintenance technical assistance team arrives on-site.	June '90	Consultant	

- | | | |
|---|-----------|--------------------------|
| 43. Consultant's construction and testing engineers leave site. | June '90 | Consultant/
USAID |
| 44. Consultant resident engineer leaves site. | July '90 | GOS/USAID |
| 45. Road maintenance equipment and technical assistance in place. | July '90 | USAID/AID/GOS |
| 46. Contractor maintenance on third 50 km ends. | Dec. '90 | Contractor |
| 47. Project accounts audited. | March '91 | USAID |
| 48. Contractor maintenance on final 35 km ends. RBPC assumes full responsibility for maintenance. | May '91 | GOS/USAID/
Contractor |
| 49. Technical assistance for road maintenance departs. | June '91 | Consultant/
USAID |
| 50. PACD. | Dec. '91 | USAID |

3. Implementation Responsibilities

(a) GOS

The primary GOS implementing organization will be the Roads and Bridges Public Corporation (RBPC) operating under the Ministry of Construction and Public Works.

RBPC will execute and manage a host country contract with the engineering consultant to provide technical assistance for field supervision of the construction work. The RBPC will approve the short list selection of construction contractors and, through a host-country contract, be responsible for the administration and implementation of the construction contract through the consultant/RBPC field supervision staff. Although the engineering service contract will be a direct AID contract, the consultant team of three engineers will function at the construction site in operational positions.

The consultant's field staff will be under the overall supervision and control of the RBPC Projects Office. The principal liaison official between the RBPC and the field team will be the RBPC project manager located at the RBPC Khartoum headquarters. The RBPC will also be responsible for the administration of the local currency project account. All field engineering supervision staff, other than the three U.S. consultant team positions, will be filled by RBPC personnel. As construction progresses the RBPC will have the responsibility of accepting completed segments of road and

assuming road maintenance operations. The first road segment of 50 km. is expected to become the RBPC's responsibility in November 1989, and the last segment of 35 km in May 1991.

Upon completion of construction, the RBPC will establish a toll collection system. The collection and use of tolls, indeed the general topic of financing road maintenance, will be dealt with under the IBRD Third Highway Project. It is expected that by the time the project road is completely open for traffic, i.e. April 1990, the system will have been worked out. Progress on financing recurrent costs will be monitored during the periodic project evaluations and the maintenance study scheduled for October 1988, the mid-point in construction.

(b) AID

Project management on the part of USAID will rest with the Project Operations Office/Engineering Division, USAID, Sudan. As a pre-implementation activity, USAID, with the assistance of REDSO/ESA, will draft a scope of work for engineering services and a CBD advertisement requesting prequalification statements. Engineering services will be executed by a host country contract with supervision of the engineering team coming under the RBPC project manager as stated above.

The USAID Project Manager will liaison between the RBPC, the consultant team and the USAID Project Operations Office, and will have the responsibility of monitoring all project activities.

(c) Project Committee

At the Khartoum level of project implementation it has been agreed between USAID and the RBPC that a project committee consisting of 4 to 7 members (1-USAID, 1-Engineering Consultant, 2-RBPC, 1-Attorney General, 2-Ministry of Finance and Economic Planning) will convene at various times throughout the project's life to review and take appropriate action to resolve administrative and technical problems that may arise and cause delays to overall project implementation. The committee will specifically be authorized to review and approve the engineering services prequalification, engineering services contract, tender documents for construction, and award of the construction contract. The project committee will maintain and distribute minutes of the meeting proceedings.

(d) AID/W

The AID/W office of AFR/TR/ENG will be requested to provide information and documents necessary for U.S. firms to submit their proposals or prequalification forms.

(e) REDSO/ESA

The REDSO/EA office in Nairobi will provide, as requested by USAID, specific technical and legal guidance for preparing the scope of work for engineering services, reviewing RFTP and IFB packages, evaluating bids, assisting with project evaluations and performing technical inspections of construction work.

(f) Engineering Consultant

The consultant must prepare in a timely manner the modified plans, specifications and contract documents for a completed IFB package, and assist in contractor prequalification. The consultant team at the field level, filling operational positions, will supervise and inspect construction work and test the quality of construction to insure that job plans and specifications are met and that all work is acceptable in conformance with contract requirements. The consultant will have a further responsibility to undertake, as directed by USAID, a road maintenance study for the development of a follow-on road maintenance program for the project and to implement any portion of this study as directed. Additionally, the consultant will be responsible for administering the project's local currency Trust Account in carrying out project activities.

(g) Construction Contractor

The construction contractor has responsibility, in conformance with the construction contract, for mobilizing his forces and constructing the specified roadway and facilities in accordance with contract plans, specifications, unit prices and contract conditions. The contractor, under the conditions contained in the contract, will be responsible for the procurement of all project commodities, equipment and follow-on support such as fuel and spare parts to implement the project. The only exception is that the consultant engineer will procure all maintenance equipment identified as necessary for the project under the mid-construction maintenance study.

To expedite the flow of offshore project commodities and equipment, all USAID approved imports procured by the contractor will be consigned to USAID/Sudan, project site. For custom clearance requirements the contractor will submit, on an arranged schedule, a master list of project equipment and commodities to USAID for approval, with the contractor having the responsibility to perform the customs and port clearance and to transport all approved items to the site. The contractor will be responsible for the procurement of all in-country shelf items, staffing of the construction work and, as contained in the construction contract, the logistical support at the project site of the RBPC and consultant engineering field staff.

4. Summation of Responsibilities

Agency

Items

USAID

- a. Approve RBPC contract for engineering services.
- b. Approve construction contract.
- c. Approve road maintenance program.

GOS

- a. Sign AID Project Agreement.
- b. Execute agreement with the ADB for funding road section one.

- c. Meet CP's for initial disbursement.
- d. Execute contract for engineering services.
- e. Approve IFB package for construction.
- f. Contract for construction of road section one with ADB approval.
- g. Sign construction contract for AID-financed section of road.
- h. Provide engineering staff for construction supervision.
- i. Accept completed sections of road.
- j. Initiate road maintenance program.

Engineering
Services

- a. Complete the design modification and IFB package for construction.
- b. Mobilize the field staff for construction supervision and perform construction surveillance.
- c. Complete the road maintenance study.
- d. Implement the road maintenance program.

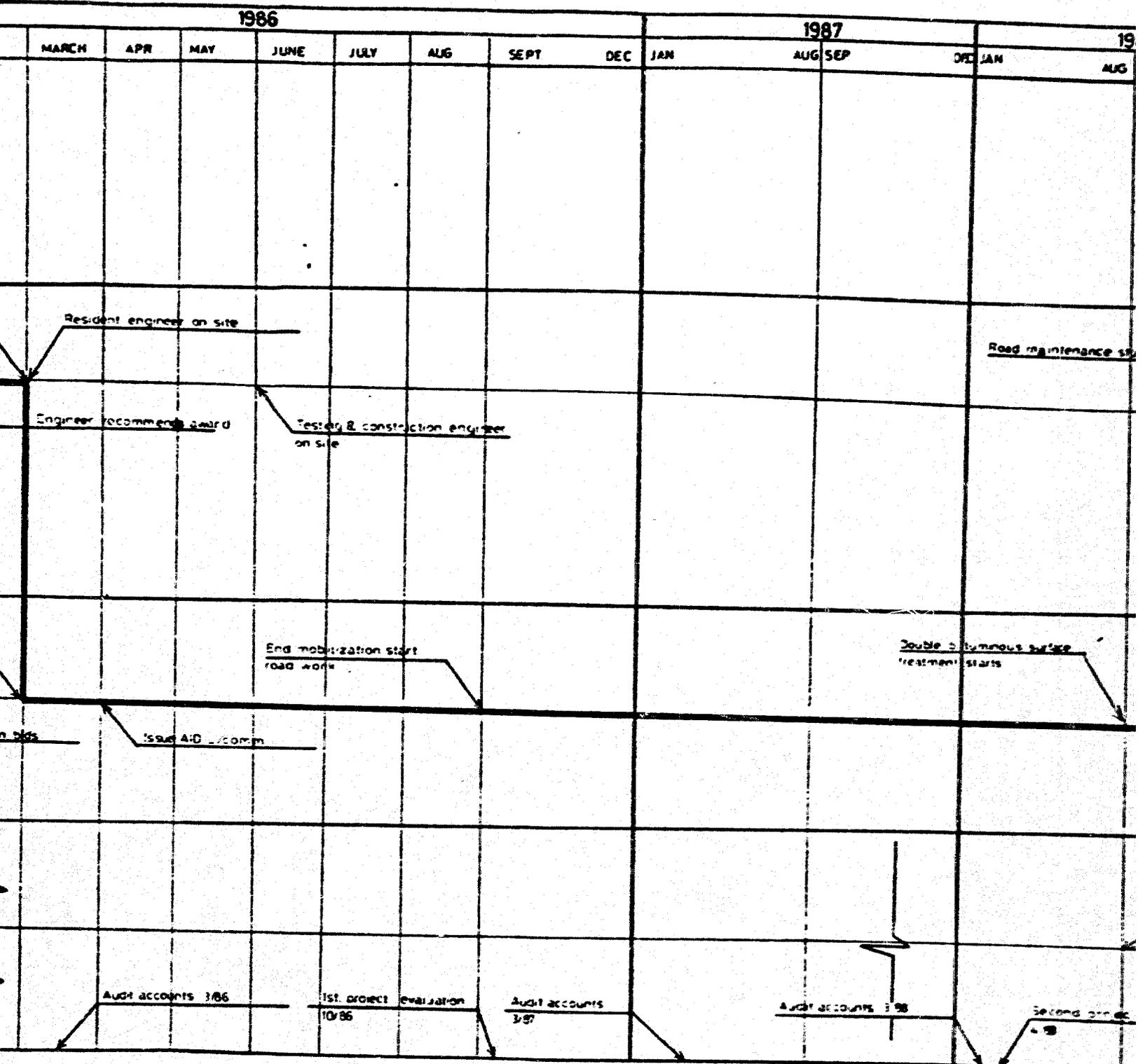
Construction
Services

- a. Mobilization of the construction force.
- b. Complete the construction program on schedule.
- c. Maintain completed road sections for year after construction.

Project
Committee

- a. Review and approve implementation actions in a timely manner.
- b. Resolve problems related to delays in project implementation.

AD/AID PROJECT 650-0069
 IMPLEMENTATION PLAN



== Critical path

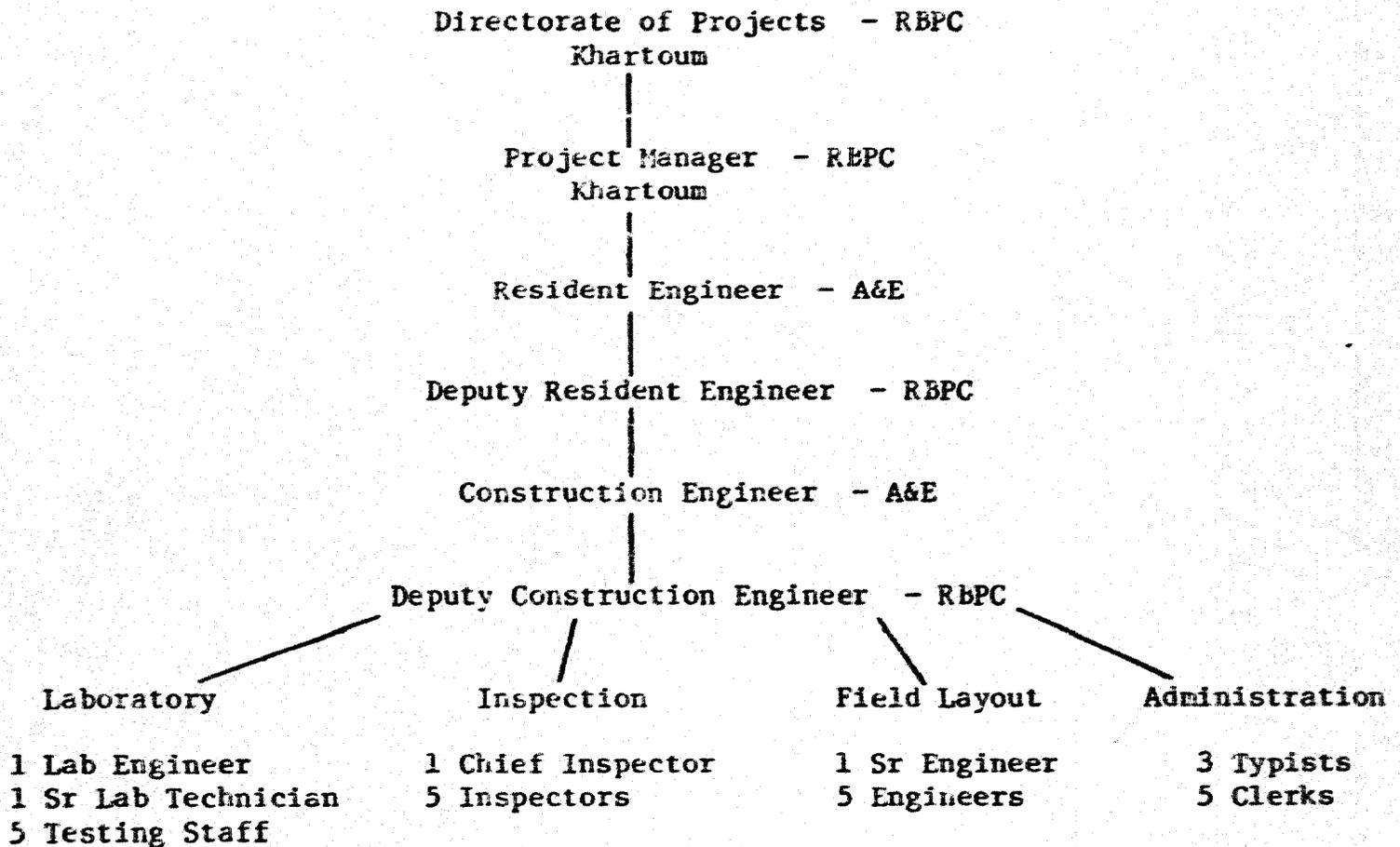
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B. Administration/Monitoring

1. Project Administration

As stated above in Section III B, the project will be implemented under the overall direction of the RBPC. The RBPC will be assisted by the engineering consultant firm which will furnish a resident engineer, a construction engineer and a laboratory engineer. Each of these people will be assigned a Sudanese counterpart. The resident engineer will be ultimately responsible for work at the construction site. He in turn will report to the RBPC project manager and project director in Khartoum. The consultant personnel will fulfill the customary functions of an engineering firm for the supervision, inspection, measurement and testing of all work. The consultant will certify all construction contractor invoices and provide technical guidance to the RBPC. (See Annex 6-E, for further details and evaluation of RBPC capabilities).

Engineering Consultant and RBPC Staffing



2. USAID Monitoring

Project monitoring and technical direction will be provided by a direct-hire engineer in USAID's Engineering Division in the Project Operations Office. This division is staffed by two senior engineers and two local-hire Sudanese engineers. In addition, USAID's engineering division is supported from the REDSO engineering office in Nairobi through periodic visits. Other REDSO staff such as the Regional Legal Officer, Contracting Officer and Supply Management Officer are available as needed. REDSO will be kept informed of the project by means of regular quarterly project implementation reports.

In addition to periodic site visits, USAID's Engineering Office will monitor the project primarily through relationships established with the RPBC staff, and reports submitted as required by project documentation. Additionally, USAID's Engineering office, will have a P.S.C. engineering Working, on short-term intervals, with the RBPC in the implementation of the project activities up to mobilization of the Construction Contractor.

C. Evaluation

1. Evaluation of the Project Goal

Four years after completion of construction, now scheduled for 1990, USAID will assemble a team to evaluate to what extent the project has achieved its goals, i.e. raising production and income in the project area and increasing the export earnings of the GOS. The evaluation will be conducted by Sudanese consultants under contract with USAID. The evaluation team will consist of an agricultural economist, a sociologist and a transport economist.

The evaluation team will compare data available in published form related to income, production and export earnings before the project with conditions prevailing at the time of the evaluation. The evaluation will focus particularly on the production and export of sorghum, gum arabic, sesame and livestock.

In addition to the goal level impact evaluation described above, project-related socioeconomic effects such as population movements attributable to the road, changes in employment patterns, and the impact of new population concentrations will be assessed as part of the environmental monitoring program. The evaluation of these project-related socioeconomic effects can draw on a substantial amount of existing information. (see Annex 6-E for a listing of available data sources).

Since the goals of the project will be influenced by outside factors, such as research, extension and improved producer incentives, the evaluators will necessarily need to use some subjective judgments regarding the extent to which improvements can reasonably be attributed to the road. The consultants will be asked to justify the rationale of their judgments and develop a methodology which will identify, to the greatest extent possible, those benefits which can reasonably be attributed to the road.

Since this evaluation is scheduled to be conducted several years after the project PACD, no funds are set aside for it in the project budget. Funds will be provided from the local currency PDS account or from CIP or PL 480 local currency generations.

2. Evaluation of the Project Purpose

Two reviews and one evaluation of the project purpose are planned over the life of the project. The reviews will primarily examine the performance of those responsible for implementation and identify implementation problems. The evaluation will consider the project's success in creating an all weather marketing link from Kosti to El Obeid and impact on food and cash crop production and trade problems.

- a) October 1986: This is an interim review to be conducted by USAID, REDSO and the GOS after the construction contractor has mobilized but before construction commences. The review will measure the performance to date of USAID, the GOS, the engineering consultant, and the construction contractor in relation to the implementation schedule, requirements of the Project Agreement, and respective contracts. The findings may lead to some adjustments in the project administration and implementation schedules.
- b) April 1988: This review, scheduled for the midpoint in the construction schedule, will analyze the same factors addressed in the interim review with specific attention to: any adjustments that were made as a result of the first review, construction progress and the development of plans for the maintenance program. The review will carefully examine whether construction progress follows the implementation plan's targets for the number of kilometers to be completed at various stages of the project. It will also review project finances and compare projected with actual disbursements. As with the first review, the review team will recommend any necessary adjustments in the project administration and implementation schedules. The team will consist of representatives of USAID, REDSO and the GOS.
- c) May 1990: The evaluation is scheduled to take place after construction. The primary purpose is to evaluate the project's impact as an agricultural marketing link between Kordofan Region and both national and international markets. It will also consider the performance of the implementing parties. Extensive analyses done for both the PID and the Project Paper provide the baseline data necessary for comparison with future developments in the area. The evaluation team will include an agriculturalist and transport economist who will reevaluate traffic counts, changing vehicle mix, and user savings and use these findings to update the current economic analysis. Although agricultural benefits were not included in the PP's economic analysis to avoid double counting benefits, they have been estimated and will be analyzed again in the evaluation to gauge any changes in the mix of commodity production and estimate the road's impact on agricultural growth. A more detailed analysis of agricultural production will be the subject of the goal level impact evaluation described in section 1 above. The evaluation will help (a) indicate the road's future returns by examining maintenance capability at the close of the project and reestimating future maintenance requirements and (b) the impact of the road on food crop and cash crop production in the project area and changes in patterns of trade.

The first two reviews will be made by a team composed of representatives from USAID, REDSO/ESA and the GOS. The evaluation will require additional assistance from a local contractor, particularly for evaluating traffic counts, vehicle mix and user savings. The construction contractor will be required to maintain a photographic record of progress throughout construction. These pictures will be helpful as baseline data. The evaluations will conform with the guidance given in A.I.D. Handbook 3, Chapter 12 and A.I.D. Evaluation Handbook, Form AID 1330-15 Project Evaluation Summary (PES) will be used. Particular attention will be given to specifying issues, discrepancies and follow up action. The USAID Project Officer will ensure that the persons or organization responsible for the corrective action as stated in the PES execute the recommendations.

VI. Project Analyses

A. Technical Analysis

1. General Route Conditions

The proposed road from Kosti to El Obeid will be the first all-weather road to western Sudan. El Obeid, the terminus of the project road, is the capital of Kordofan Region, as well as the largest city in western Sudan. The alignment follows the northern side of the railway until a point near El Obeid where the road crosses the railway. On the alignment, drainage requirements are defined by existing structures in the railway embankment. The terrain is flat to slightly rolling along the entire route. The soils over the first 166 kilometers from Kosti are sand and clay. The soils over the last 135 kilometers westward are predominantly sand and some gravel. From El Obeid, an all-weather road to Kadugli, the capital of South Kordofan, is nearing completion. To points further west, including all of Darfur, access is still limited to desert tracks or the railroad. Along the route, the Kosti - El Obeid road passes through the local market centers of Tendelti, Umm Ruwaba, and El Rahad; otherwise there are few population concentrations. No improved roadway or segments of roadway now exist between these market centers. Given the fairly low population density along the length of the road, a small portion of the project traffic is local. Most traffic runs, and will continue to run, between the Nile area and El Obeid.

2. Design Standards

The road in typical cross section has an embankment width of 10 meters, consisting of two 1.5 meter shoulders and two traffic lanes of 3.5 meters each. The average embankment height is 0.60 meters. The pavement structure extends across the whole width. The traffic lanes will receive a double bituminous surface treatment wear course. In such a wear course, the compacted crushed stone base course is evenly sprayed with asphalt, over which a thin layer of crushed stone is spread, and rolled. This procedure is then repeated to provide a double surface treatment. This treatment effectively seals the top of the pavement against damaging intrusion of rainwater and interlocks the stone chips in the surface wear course so that they are retained in place under the abrading action of vehicular wheels. The size and quality of the stone, type of asphalt used, and the rate of application are crucial to the success of the wear course.

The road was studied and designed in two sections: the Kosti-Umm Ruwaba section by NORCONSULT (1981) and the Umm Ruwaba-El Obeid section by Dar Al Handasah (1982). The feasibility studies and design were reviewed and updated by Louis Berger International, Inc., in November 1983.

The original design standards for both sections were essentially the same - a roadway of 7.0 meters, with shoulders 2.0 meters wide. These dimensions conform to AASHO standards for secondary roads, except that the typical major road in Sudan has 1.5 meter shoulders. Berger recommended a 1.5 meter shoulder and calculated the corresponding cost savings. The costs used reflect these savings.

The final designs also called for the greater part of both roads to be constructed in fill (embankment) which accounted for 18 - 25% of total road construction costs. Berger recommended less embankment, 0.6 meters rather than the design standard of an average 0.84 meters, which also resulted in a cost savings to the project.

The pavement design for the Kosti-Umm Ruwaba section, determined by expected traffic, called for 10 cm of cement treated subbase, 15 cm of cement treated base for the first 50 kilometers west of Kosti and for 15 cm of cement treated sub-base with 10 cm of crushed stone base for the balance of 116 kilometer. The entire road is designed with a double bituminous surface treatment. The Umm Ruwaba-El Obeid section called for 15 cm of subbase gravel, 15 cm of crushed stone base and a double bituminous surface treatment. Both sections were designed for asphalt overlays some years later after the road had carried 0.5 million standard axle loads. These designs for the pavement structures took into consideration the materials available within a reasonable haul distance from the road. Berger concluded that the shoulder designs for the Kosti-Umm Ruwaba section were adequate but that the Umm Ruwaba-El Obeid section should be amended to show an edge seal to the roadway and a continuation of the first surfacing to the edge of the crushed stone base and to seal the shoulders to reduce erosion. These recommendations were incorporated into the project design.

From a technical viewpoint, the design standards as amended by Berger are adequate, except for one point. The PP team did not agree with the use of cement treated base and subbase, even though it would be more economical than the use of aggregate bases because of the location of the source of aggregate. Stabilization treatment is a method of construction that requires very close quality control regarding placement. Under the best of circumstances, it is a difficult method of construction. In Sudan, because of high temperatures and dry conditions it would be extremely difficult to achieve quality work. If not done successfully, the bases will show early failure under expected traffic loads. USAID had this particular type of construction independently studied and concluded that it was a high risk undertaking (see Annex 6-A for details of the study). USAID recommended to the RBPC that a cement treated base and subbase be eliminated from the design and be replaced with crushed stone, even though it was more expensive. The cost analysis developed for this PP includes a crushed stone base pavement structure.

3. Cost Analysis

Berger reviewed the unit rates and quantities used in the original studies. The NORCONSULT rates were acceptable, but the D.A.H. rates were underestimated. Berger found it necessary to make adjustments in measurements and unit rates. It appears that Berger did a very thorough analysis of the unit rates. Berger then analyzed price increases for, among other things, local labor, fuel and cement, and calculated the effect of inflation on these items. This was done in coordination with the Ministry of Finance and Economic Planning. By an examination of the relationship of foreign exchange to local currency in the units of measurement, it was determined that construction costs broke down into 83% FX and 17% local costs, at 1981 prices. Berger further adjusted the unit rates for inflation: a 25% increase

per year for the local currency component and a 7.5% increase per year for the foreign exchange components. The Berger approach to unit measurements and costs appeared reasonable and were used as the basis for the estimated cost analysis in Section IV above. The cost analysis presented in the PP also adds a 10 percent contingency for all items.

4. Maintenance

Berger strongly recommended a maintenance component to the project. The report recommended that the construction contractor stockpile materials at locations along the road for subsequent maintenance use. Berger distinguished between routine and periodic maintenance and priced out maintenance costs on that basis. In addition, the report recommended a maintenance organization and expatriate technical assistance. The Berger recommendations were all reasonable. However, maintenance plans were limited to the 301 km of road, except for major equipment use and repair. The PP team found there was considerable interest in maintenance on the part of the RBPC and the World Bank and that as a result of several factors, particularly implementation of the Third Highway Project, the capabilities of the RBPC in road maintenance should improve over the next five years. In addition, the PP team considered maintenance as a regional program not limited to the Kosti-El Obeid road. Berger's proposal for maintenance workshops, stockpiling of materials, and limited technical and equipment assistance was accepted. In addition, the maintenance program developed for the Project Paper provides for a maintenance study in 1988 to identify maintenance needs at the close of the Project. A program will then be developed which takes into consideration expected improvements in RBPC maintenance capabilities, as well as any remaining shortcomings. The project budget provides funds for technical assistance and equipment under the maintenance component.

5. Contract Documents

Berger made several recommendations for the final preparation of the contract documents. The report recommended combining the Kosti-Tendelti and Tendelti-Umm Rowaba sections for contract purposes. Berger recommended changes in contract conditions related to variations in prices, import duties, licenses and taxes, retention money, and time for payment of monthly invoices. The document will require quite extensive revisions in order to conform to U.S. highway construction contract procedures, standards and conditions. This situation influenced the Project Paper team's decision to limit the engineering services contract to a U.S. engineering firm. The engineering firm that will be contracted to supervise construction will amend the bidding documents to conform to the Berger recommendations.

6. Engineering Services

The U.S. engineering firm will be required to update the construction costs to the planned bid opening date (March, 1986). As part of the design analysis to be reviewed by the engineering firm a value engineering analysis will be applied to the proposed design standards and construction implementation plan. Any cost reductions resulting from this value engineering analysis will be planned for use in pavement upgrading. It is planned that the engineering contract will have a provision to require a formal value engineering analysis of the project at any point in the life of the project, as directed by the RBPC and USAID. This study would be executed by sub-contract under the engineering contract.

7. Conclusion

USAID concludes that the project as originally studied, amended by Berger and further amended for this Project Paper, is technical sound. The implementation plan and schedule presented have taken into consideration the actions necessary to implement the project, the experience AID has obtained from similar projects, and the capabilities and limitations of the RBPC, AID and contractors. A considerable burden of implementation has been placed upon the RBPC. This was done after careful consideration of the RBPC personnel, and in cognizance of AID General Notice, CM/SD/POL, December 28, 1983 - Subject: Responsibility for Procurement.

B. Economic Analysis

1. Economic Viability

The economic viability of the road was re-verified in November 1983.* The results of that study were summarized in the PID and relevant parts of the economic reappraisal are reprinted in Annex 6B. This section outlines the modifications which have been made in the analysis presented in the reappraisal as a result of further study.

- (a) The engineering analysis presented in this project paper estimates higher construction costs, principally due to the change in base materials from those used in the original design.
- (b) Construction costs have been spread out over six years (actually five years after an initial small disbursement in 1985 for which no incremental benefits are assumed).
- (c) Maintenance costs and salvage value were retained from the Berger analysis.
- (d) Average Annual Daily Traffic, Growth Rates, Vehicle Mix, and Vehicle Operating Costs were re-examined. The Ministry of Finance and Economic Planning, with UNDP assistance, has completed a preliminary draft of a traffic survey covering all of Kordofan in late 1983. The information was unavailable to the Berger team. A review of this work to the degree that data and methodology were comparable essentially confirms the validity and conservative nature of base year AADT, Vehicle Mix, Growth Rate Assumptions and VOC savings used in the Economic Reappraisal. Benefits included in the analysis are limited to user savings. Although significant agricultural benefits are expected (as discussed below), methodologies for quantifying these benefits are not fully developed.

* Louis Berger, Inc. "Economic Reappraisal of the Kosti-El Obeid Road".

By way of comparison, traffic on the Port Sudan - Yassala road shows the following growth in total vehicles and the changing vehicle mix:**

	<u>June 1975</u>		<u>May 1978</u>		<u>December 1982</u>		<u>1975-1982</u>
	(Road unpaved and barely passable by passenger cars and light trucks)		(Road in process of paving)		(Paving completed)		(Average annual growth)
	<u>ADT</u>	<u>(% Total)</u>	<u>ADT</u>	<u>(% Total)</u>	<u>ADT</u>	<u>(% Total)</u>	<u>%</u>
Passenger cars and light trucks	10	(4)	230	(31)	606	(40)	72.8
Buses	8	(3)	1	(-)	32	(2)	20.3
Medium size Trucks (c.6T)	218	(79)	439	(59)	384	(26)	7.8
Heavy Trucks	13	(5)	27	(4)	77	(5)	26.8
Truck-Trailers	23	(8)	42	(6)	252	(17)	37.6
Others	4	(1)	3	(-)	151	(10)	62.3
Total	<u>276</u>	<u>(100)</u>	<u>742</u>	<u>(100)</u>	<u>1502</u>	<u>(100)</u>	<u>25.3</u>

The 25% annual growth in ADT manifested above is not expected to be achieved on the El Obeid route, but the Berger projections of 6.0 and 5.6% per year for the first 6 and 10 years again seem conservative, as do other forecasts presented by Berger. Hence the net user benefit stream calibrated in the reappraisal has been retained.

** Road Traffic Survey: Density and Freight Estimation on Major Roads of the Sudan, MFEP Transport and Communication Sector and RBPC (Feb. 1983, Handwritten Draft).

2. Agricultural benefits

The economic reappraisal team, as stipulated in their scope of work, estimated agricultural benefits by the net producer surplus method separately from user benefits. These induced agricultural benefits vary from 13% (Year 1) to 39% (Year 6) of estimated total user benefits. The following assumptions were used:

- (a) Prices are assumed to be constant with a price effect conditioned upon a portion of the transport savings (50%) being passed on to the producer under an assumption of unitary elasticity and competition among the transporters;
- (b) Present yields remain constant. Increased yields due to research and extension cannot be attributed to the project;
- (c) Farm labor productivity remains constant since improvements cannot be attributed to the road;
- (d) No agricultural benefits in the important food grain and gum arabic production subsectors are attributed to the road.

These assumptions of induced agricultural growth are essentially conservative. Since some of these constraints will be reduced due to other activities in the area, induced benefits for agriculture may be higher than estimated, but correctly cannot be attributed to the road project per se. Project induced agricultural benefits are ascribed to livestock, groundnuts, sesame, horticulture and cotton in that order. Crop production benefits are due to an increase in labor supply and acreage, not mechanization.

Berger estimated benefits to rise from approximately LS 4 million in 1988 (Year 1) to LS 24 million in 2007 (Year 20) drawn principally from increased acreage in South Kordofan which is linked to El Obeid by the El Obeid-Dubeibat-Kadugli paved segment. Additional benefits will be induced by road improvements west of El Obeid to En Nahud and beyond and by likely feeder road extensions south of Kadugli. These benefits were not estimated by Berger. Judging from agricultural production levels, potential growth and existing traffic counts, these additional benefits should be substantial.

Despite the reasonable nature of agricultural benefits, they were not included in the economic analysis because of potential double counting of benefits and questions of methodology. Berger contends in its reappraisal report and subsequent correspondence that there is no double counting between user and agricultural benefits, principally because agricultural produce represents profitable west-to-east backhauls against the prevailing east-west movement of goods. While economic literature acknowledges the possibility of counting both user and agricultural benefits for road projects, it also stresses that residual agricultural benefits (after subtracting transport costs from market prices) are difficult to quantify and influenced by uncontrolled and unverifiable non-project factors. Electing a more conservative approach, USAID chose to exclude agricultural benefits from the economic analysis for the following reasons:

- (a) While the agricultural benefit estimates were conservative, the mechanism was less certain. Applicable agricultural benefits must stem from increasing cultivated area under current technology. Since labor supply growth is independent of the road (which may create unpredictable migration patterns), the means by which the labor force expands to fill new land is not clear. For this mechanism to work, labor would have to either be partly unemployed, find that increasing production is more profitable than alternative activities, or migrate into the area for employment or production opportunities. Although it is not likely that labor is underemployed during the planting season, current trends suggest that labor will migrate into the region during peak demand periods (when wages are highest) and that farmers may now find higher returns from non-agricultural activities once planting a minimum acreage. It is reasonable that higher profits will attract additional labor to agriculture, but quantifying the amount, much less quantifying the impact on production, is uncertain.
- (b) Assumptions would also be required on uniform land availability in the vicinity of the road, but environmental analysis and desertification studies show that parts of North Kordofan are under crop and livestock pressure. These pressures are not equal throughout Kordofan and are certainly less in the better-watered south, but details on land and labor supply are insufficient to merit quantification beyond a descriptive analysis of expected benefit flows. This descriptive approach is taken in the social analyses included in the text and in annex 6D.
- (c) In general, including induced benefits in an economic analysis is subject to some dispute. Since user benefits include agriculturalists, and since increased traffic projections include agricultural inputs (east to west) as well as products (west to east) it seems that at least some agricultural benefits are already embedded in the user benefits and should not be double counted.^{1/}

^{1/} "The Economic Analysis of Rural Road Project", C. Cornmark, J. Biderman, D. Bovet. World Bank Staff Working Paper 241 (8/76). The authors warn against mixing agricultural and user benefits and suggest that for AADT above 50, such as the El Obeid Road, only user benefits should be employed.

- (d) Finally, the road is a highly favorable investment on user benefits alone and the justification need not be clouded by including induced agricultural benefits, although these doubtlessly will be present due to the road and other investments and technology changes.

3. Exchange Rate

Dual exchange rates, where they exist, do not normally present major problems in economic analysis since differences are small enough to be bracketed by sensitivity test. However, there are three highly divergent exchange rates present in Sudan which have a bearing on the economic analysis. The Berger team estimated local currency project costs and benefits directly in Sudanese Pounds (LS). Where necessary for financial documentation, construction costs were converted at the official rate of LS 1.3/\$. However, no transactions regarding the road will actually be completed using this outdated and now overvalued exchange rate. At the time of the Berger analysis and the PID the "commercial bank rate" stood at LS 1.8/\$ and the "free market rate" stood at about LS 1.9/\$. Legal transactions were carried out at both of these rates. Since divergence was not great, the PID and certain of the Berger calculations used the commercial bank rate of LS 1.8/\$ for vehicle costs and other conversions.

Since that time, the commercial bank rate has remained at 1.8 but the free market rate has fallen to LS 2.4/\$, indicating a strong de facto devaluation which governs many commercial transactions. There are rigidities in the system. Because of government and private foreign exchange shortages, it is easier to sell dollars than to buy them. Traders, for example, need foreign exchange liquidity to pay for advance orders and delivered goods. This, along with other factors, drives the free market value of the LS down. The shadow exchange rate appropriate for economic analysis is felt to lie between the commercial bank rate and the free market rate, but closer to the latter. A formal devaluation of the commercial bank rate (and probably the official rate) is expected in an effort to reduce the divergence, spur exports, reduce imports, and wring subsidies out of the system. A shadow price of LS 2.2/\$ is currently more reasonable than the previously used LS 1.8/\$ rate. For the economic analysis which follows, denominated in US\$, this LS 2.2/\$ shadow rate is used throughout. In comparison with the Berger report and PID analysis, the effect is to lower the local currency construction costs (and hence the total costs converted to dollars) with a near-term favorable impact on the Economic IRR, but to lower the benefit stream as well, with greater far-term impact on the nominally larger but more heavily discounted future benefits. The net effect of the exchange rate shift and the increased construction costs estimated by the PP team engineers is to reduce the Economic IRR.

4. Internal Rate of Return and Net Present Value

The results of the re-analysis are shown in Table VI.B.1. for a project life of 20 years. IRR is 23.74% and NPV is \$32,691,220 at a discount rate of 15% which appears more reasonable than the 10% rated used in the PID. Most sensitivity tests involving reassessed costs, and decreased or delayed benefits remained positive. Under an extreme case of cost increase by 20% and

Table VI.B.1.

Kosti - El Obeid Road

Economic Internal Rate of Return Analysis

Costs (\$000)

<u>Project Year</u>	<u>FY</u>	<u>Construction^{1/}</u>	<u>Maintenance^{2/}</u>	<u>User Benefits^{3/}</u>	<u>Net Benefits</u>
0	1985	- 1085	0	0	- 1085
1	1986	19343	- 173	13364	- 6152
2	1987	- 31703	- 200	14410	- 17493
3	1988	- 38119	- 214	15455	- 22878
4	1989	- 24532	- 236	16591	- 8177
5	1990	- 10752	- 264	17727	6711
6	1991	0	- 286	18864	18578
7	1992		- 309	20000	19691
8	1993		- 3359	21091	17732
9	1994		- 355	22273	21918
10	1995		- 373	23545	23172
11	1996		- 4355	24909	20554
12	1997		- 7555	26364	18809
13	1998		- 3473	27682	24209
14	1999		- 155	29000	28845
15	2000		- 159	30500	30341
16	2001		- 159	32000	31841
17	2002		- 164	33545	33381
18	2003		- 168	35273	35105
19	2004		- 173	37000	36827
20	2005		- 177	(38955)	38778)
				(25750 salvage	25750)

IRR = 23.74%, NPV = 32,691,220 (Discount Rate = 15%)

Extreme Sensitivity Test: 12.50%

Construction and Maintenance Costs increased 20%

Benefits decreased 20%, negligible Salvage Value

^{1/} Combined USAID (\$), ADB (\$), GOS (LS converted to \$ at 2.2) as re-estimated by PP team.

^{2/} As estimated by Louis Berger Int., "Economic Reappraisal of Kosti - El Obeid Road" with LS reconverted to \$ at the 2.2 rate.

^{3/} User benefits as estimated by Berger, but excluding Berger's estimates of induced agricultural benefits. LS reconverted to \$ at 2.2. Salvage value as estimated by Berger for Year 20.

benefit decrease by 20%, with no salvage value, the IRR was 12.5%. However, benefits have been conservatively estimated and cost estimates have been refined so such extreme negative divergences are considered unlikely. From this point of view, given the additional expected agricultural benefits induced by the road and the linkage that the road represents both to Khartoum, Port Sudan and to the South and West, the Kosti-El Obeid road in its entirety represents an economically and strategically viable project.

From the financial point of view of the transporter, savings in vehicle operating, repair and maintenance costs are sufficient to induce private owners to use and expand service as they have done in the case of the Khartoum - Port Sudan Road, assuming as always, adequate fuel supplies. This potential constraint is being met in the short run by AID's and other donor's petroleum initiative and in the longer run by exploitation of domestic source.

From the foreign exchange viewpoint, the effects of the project are positive due to export growth of dryland agricultural produce and lower imports due to greater fuel efficiency, lower replacement parts requirements, higher capacity utilization (Truck Ton-Km/Yr) and longer vehicle life.

Due to the relatively low percentage of local currency costs in the total project cost (19% at the LS 2.2/\$ exchange rate used), the results are relatively insensitive to exchange rate fluctuations. The analysis is presented in dollars and there has been a recent tendency in Sudan, as a result of policy reforms, to price fuel, spare parts and other commodities close to the shadow rate.

C. Social Analysis

1. Introduction

The 301 kilometer journey from Kosti to El Obeid takes 12 hours under good dry season conditions and becomes a several day venture during the wet season because of flash floods and clay soils. Poor transport has had a direct impact on production incentives, farmer income and overall agricultural production. In clay soil areas extension services become impossible during the growing season when farmers require technical assistance to gain the full benefit of new technologies. Improved agricultural inputs, when they are available, are never certain to arrive before the critical planting days soon after the first rains. The economic disincentives to production are also persuasive. Slow travel and rough roads mean high transit costs to compensate for time, vehicle repairs and fuel. These costs cut directly into the farmer's return on his crops. They also take away from real income since farmers must pay high prices for the tea, sugar, and other commodities brought to villages in the region. All of these factors - costs, access to extension, timeliness of inputs - affect both mechanized and traditional farming. Further analysis of the social, cultural and economic factors which influence a farmer's capability and desire to produce more indicate that the Kosti-El Obeid road will benefit most inhabitants of the project area.

2. Socio-Cultural Context

Population in the project area is greatest during the rainy, cropping season and lowest during the dry season. Sedentary farmers living in clustered villages of straw huts accessible to water points constitute 75 percent of the rural population. Transhumant households make up 15 percent of the wet season population when they often join sedentary communities and cultivate land. During the dry season months the transhumants migrate along predictable annual routes seeking water and grazing areas for their livestock. Nomads who raise mostly cattle and sheep account for the remaining 10 percent of the population during the rainy months. In October, the nomads begin a long-distance trek to the southern provinces in search of water and pasture. Although not immediately in the project area, mechanized farming schemes are nearby in Habila and Abu Hamra, Southern Kordofan.

The sedentary population is dispersed in villages that vary in size from 25 to 1,000 people or more. The average household numbers between seven and eight members. Nuclear family residences are preferred, but extended families, matrilocal families and other household arrangements are common. The household is the basic unit of consumption, but agricultural production rests with several decisionmakers in the household. It is common for husbands and wives to manage separate farms. Unmarried sons and daughters also manage small plots when land is available. The four most common crops are millet, sorghum, sesame and groundnuts. The cereals are primarily subsistence crops, though surpluses are sold to other farmers and at local markets. Most farm families own a donkey and several goats, and better-off families invest in sheep and cattle.

Besides farming, virtually every household has members who work in secondary occupations on a seasonal basis to supplement the family's cash income. Off-farm activities include charcoal making, water-hauling, tailoring, carpentry, metalworking, and operating village shops and bakeries. Possibly most important for supplementing income is dry season migration for wage labor on mechanized farming schemes at Habila to the southwest and Gezira to the east. On the mechanized schemes only plowing is done by machines. Weeding, harvesting and threshing remain manual operations. Moreover, because labor is a significant production constraint in the region, mechanized and traditional farming can be complementary activities. Traditional farmers provide labor, and mechanized farm owners provide jobs when other rural employment opportunities are not available.

3. Beneficiaries

The farming and employment patterns in the project area imply that northern Kordofan's rural economy is not just subsistence-oriented, but is dependent upon trade. Farm households purchase food and commodities at village shops each day or several times per week. These goods are paid for either in cash or in kind with produce from the next crop used as credit. In the latter case the future crop is usually offered to the merchant as payment, the price of the crop usually reflecting harvest prices at major markets minus the cost for transport and a profit margin for the storekeeper. Thus, exchanges involving both crops and commodities have prices associated with them which are affected by the cost of transportation.

Traditional farmers, both men and women, will benefit from the Kosti-El Obeid road by paying lower prices for the commodities they buy and receiving higher prices for the products they sell. The income effect will be significant. Although the present Kosti-El Obeid stretch should be a major market-to-market route where transportation costs are low (i.e., 20 piasters/ton/kilometer), road conditions make the route the equivalent of a farm-to-market road where costs average 70 piasters/ton/kilometer. When transportation costs fall, real farm income will rise, thus beginning a long-term process which is necessary to allow farmers to pay for new production technologies and accept the risk inherent in changing from traditional inputs and farming methods. For the farmer, being in a position to grow more and to earn more for his output will prove a more significant benefit than the immediate reduction in transport costs.

Farmers on mechanized schemes with access to the road will also benefit. Mechanized farms produce most of Kordofan's surplus grain, which truck owners move to rail centers or urban markets. If crops are sold for export, their owners must incur additional transport costs over poor roads or an inefficient rail system to Kosti, which serves as an outlet to Port Sudan. The improved Kosti-El Obeid road will both reduce the cost of transport and increase the effective capacity of the transport system, and hence the ability to move surplus production from the Kadugli-El Obeid-Kosti corridor. Both of these factors are incentives to produce and market more. Since labor, as well as lack of marketing routes, is a constraint on mechanized farm production, increased demand for labor should result in higher wage rates for seasonal labor, much of it drawn from the traditional farm population. Displacement and impoverishment of traditional farmers as mechanized agriculture becomes more profitable is not likely to be a problem because of the unmet demand for labor and because untilled land of equivalent or better quality is available to the south. (As the return from additional investments in rainfed agriculture is greater in Southern Kordofan where rainfall is higher and more consistent than in the north, these benefits may be expected to be more pronounced in the south.)

D. Administrative Analysis Roads and Bridges Public Corporation

1. Organization and Project Management

As stated in Section III. B. above, the engineering services and construction contracts will be host country contracts with RBPC. As an organization RBPC has existed since 1973. It is responsible for the overall study, design, construction and maintenance of national roads and bridges in Sudan. Being the only government body with experience and capabilities in the field of roads and bridges, other government agencies planning roads or maintenance seek technical advice from RBPC.

RBPC employs 157 graduate engineers, 116 technicians, and 237 accountants, clerks, and storekeepers. Included in the professional staff are 21 engineers and 29 technicians in the Maintenance Directorate. It also employs 1,170 laborers, of which 75 percent are skilled, and recruits seasonal workers for those projects it is constructing with its own forces.

This project will be administered under the overall direction of the Director for Projects. He holds a M.Sc. degree in civil engineering from the University of London and has been in his present position since 1976.

RBPC has identified the GOS Project Manager. He holds an M.Sc. degree in Civil Engineering from Washington State University and has twelve years experience in road design and construction. He is a former employee of USAID/Sudan and familiar with USAID procedures and policies.

Technical reviews and approvals such as the selection of the engineering consultant, prequalification of the construction contractor, review and approval of construction tender documents and change orders will be performed by the RBPC and USAID with the engineering consultant involved as appropriate. Routine financial reviews and approval of local currency and foreign exchange invoices will be performed by the engineering consultant, the RBPC and USAID. Review and approval of the construction contract award and the construction contract will be by a project committee authorized by the Ministry of Finance and Economic Planning. The Chairman of the RBPC will sign the construction contracts. The project committee will consist of the RBPC Director of Projects, the RBPC Project Manager, and one representative each from the Ministry of Finance and Planning, the Attorney General's office, the engineering consultant and USAID. It is intended that the reviews and approvals not go beyond that stated above. A condition precedent to the issuance of the tender document for the construction contract will be included in the Project Agreement requiring establishment and authorization of the project committee.

2. Qualifications of the RBPC

Since its establishment in 1973, the RBPC has been directly involved in the construction of approximately 1770 km of roads. About 400 km of these were constructed by force account and 1370 km constructed through contracts signed with various international A&E and construction firms. In most cases these were direct contracts with the RBPC, with RBPC providing the project manager, inspector and laboratory personnel. The 1370 km constructed by international firms involved nine A&E and construction contracts. The RBPC follows customary accepted procedures for international competitive bidding. They are thoroughly familiar with the process.

Given the current RBPC organizational framework, numbers and qualifications of personnel, and overall experience in managing road projects, USAID believes the RBPC has the capability to implement the project through host country contracting procedures. While this is a relatively large project, it is not a difficult one to manage, and there are no unusual or difficult construction problems. It is a straight road through flat terrain with no major structures required. However, it is located in a remote area where somewhat adverse climatic conditions prevail. The RBPC will be assisted through the selection process by a qualified engineering consultant and a construction firm and by close monitoring by the USAID staff.

Of the four on-going projects under the RBPC that are listed in Annex J, three will be completed prior to the beginning of construction on the

Kosti-El Obeid road. No new projects are anticipated other than this project. With this relatively light work load, the RBPC will have no difficulty appointing qualified personnel to the project.

USAID therefore concludes that the RBPC has the capability to implement the Kosti-El Obeid road project as planned in this Project Paper. This decision is based upon the experience of the RBPC, the qualifications of the personnel available, and the current and future work load. The RBPC will be assisted by the engineering consultant and USAID. From numerous discussions between USAID and the RBPC while preparing this Project Paper, the RBPC indicated an understanding of what has to be done and how to do it.

3. Construction Supervision

The RBPC will furnish counterpart personnel to the engineering consultant in addition to providing laboratory, measurement and testing, and field layout personnel. USAID has held several meetings with RBPC management to discuss the caliber and experience of the personnel that the RBPC would be expected to provide. The RBPC gave assurances that they did have qualified personnel and that they would be available.

4. Road Maintenance

The background and analysis of the RBPC's road maintenance capabilities are contained above in Section III. B.3. With the assistance that the RBPC will receive under the Third Highway Project, it is anticipated that the level of competence will be greatly improved by November 1989, when they will accept responsibility for the first 50 km segment of the project road. The RBPC's road maintenance capabilities will be evaluated during the maintenance study in October 1988. The Kosti-El Obeid road project is designed to provide equipment and technical assistance to augment the RBPC as necessary and to provide for overcoming shortcomings that may exist when the RBPC assumes responsibility for maintenance.

5. Production Supplement

The RBPC salary scale is quite low and as a result trained and experienced technicians frequently leave for higher salaries offered elsewhere in the Middle East. For this project the RBPC is furnishing the field layout, inspectors and testing personnel in addition to counterparts to engineering supervision. Because it is a construction project, the engineering supervision personnel will be expected to work whenever the construction contractor works. Very likely, the contractor will work long hours, perhaps sometimes at night and on holidays. In an effort to retain RBPC personnel for the life of the project and compensate for the remote site location and long hours, it is planned to provide a production incentive to the Sudanese personnel assigned to the construction supervision team. This practice is customary on donor financed projects and sanctioned by the RBPC. The funds will be provided from locally generated currency, administered by the resident engineer and paid from the Trust Account. The details of the production supplement will be developed by RBPC, AID, and the engineering consultant firm. Payment will be based on experience performance and position. Approximately 1800 person months will be provided by RBPC personnel. For purposes of the budget, LS 1.0 million is planned for the life of the project.

E. Environmental Analysis

The PID for this project contained an Initial Environmental Examination which recommended that an Environmental Review be conducted for this project in conjunction with other road projects. The scope of work for the Environmental Review was prepared by the REDSO/ESA Regional Environmental Officer and is attached as Annex K. This fulfills the requirement of the Africa Bureau Environmental Coordinator for this Project Paper (State 113698, Annex K). Among other things, the contractor will be required to:

- (1) develop a program to monitor habitat/species/settlement interactions; and
- (2) outline a cooperative process whereby the GOS can develop the institutional and technical resources to carry out an environmental monitoring program for roads.

The Environmental Review will be conducted by the Institute for Environmental Studies (IES) at the University of Khartoum. A contract was signed with them during the first week of April 1984. Besides conducting this review, the IES will also provide expertise for monitoring on an occasional basis the effects of the road. This will include the planning and implementation of a workshop which will take place prior to the project evaluation scheduled for April 1988. One objective of this workshop will be to discuss the cooperative process mentioned above and work out an implementation plan for the GOS.

F. Capital vs. Labor Intensive Road Construction and Maintenance

The design standards established for this road minimize the use of labor intensive construction methods. The technical requirements of compacted subgrade, embankments, base courses and surfacing to meet minimum specification levels rule out the use of extensive hand labor for most road construction operations. The sparse population along the project route and within the region, along with the already reported seasonal shortages of labor in the area for agriculture work, further precludes the use of labor intensive methods.

In considering the labor/equipment mix, it is possible to reach an optimal balance for road construction, taking into account climate, population density and construction standards. For this project, reliance on equipment is preferable. Other than the possible construction of drainage structures and building facilities, it is not expected that labor intensive construction methods will be used.

However, the tender documents will be designed to favor the award to the bidder with a high local cost component. This will encourage foreign contractors to seek Sudanese participation to the maximum extent. For example, a contractor will be able to maximize local currency costs by subcontracting with local firms to do the hauling of aggregate rather than purchase and import trucks. If local contractors have the equipment to do compaction, a foreign contractor could subcontract that work rather than

import equipment for doing it. It is intended to utilize Sudanese contractors and labor to the greatest extent possible. This should result in the optimal use of labor intensive construction methods compatible with the design standards, specification requirements and construction contract time.

The RBPC will be encouraged to use contract labor for road maintenance. This was addressed in the Berger study and will be a subject of the maintenance study that will be made by the engineering consultant.

G. Analysis of the Project's Energy Efficiency, Cost Implications and Appropriateness

The project requires a high capital cost in road construction equipment, vehicles, and equipment management. The road construction technology being applied, i.e. equipment intensive road construction, was selected as the most efficient way to achieve project outputs considering potential constraints. The technology being applied is limited to the consumption of fossil fuel non-renewable energy resources. This represents a high capital cost in terms of equipment and equipment support, and high operational costs with regard to fossil fuel consumption and spare parts. All of these activities require scarce foreign exchange. The use of capital intensive technology is predicated upon: (a) labor constraints within the project area; (b) physical problems which preclude the use of labor intensive road construction, and (c) vast distances, low population densities and harsh climatic conditions which militate against the use of a high labor/equipment mix ratio. The selection of technology for the project was made on the basis that there were no effective alternative options.

The efficient, but high cost capital intensive technology to be utilized for the project means that the host government cannot replicate the road in the near term without donor assistance. Indeed, virtually all road construction in Sudan has been donor-financed. Through efforts undertaken in this project and the Third Highway Project, the maintenance component of the project should be both affordable and replicable. For major road construction, start-up costs, foreign exchange requirements, and projected balance of payment problems will continue to constrain the GOS. Not using fossil fuels is, of course, technically unfeasible for the work needed to construct this primary road. The formula for an optimal labor mix can only be determined by the construction contractor's response to the tender conditions and the labor/machinery mix adopted in doing the work.

II. Conditions Precedent (CP'S) and Covenants

The Government of Sudan has been in arrears to the African Development Bank which, until recently, precluded a firm ADB commitment to co-financing the project. In May and June 1984 the GOS paid \$4 million of their outstanding debt and in late June submitted a repayment plan for their outstanding arrears. Based on these repayments and the credibility they gave to the GOS plan for meeting outstanding arrears, the ADB decided to begin processing its documentation for the Kosti-El Obeid road. Provided that the GOS abides by its repayment plan, the ADB will sign a project agreement with the GOS during this ADB fiscal year.

There is good reason to believe that the GOS will abide by its repayment plan. At a time of extremely tight foreign exchange in Sudan, the GOS has diverted \$4 million in just two months to repay the bank. These payments mean little for the GOS unless their ADB arrears are fully paid, thus freeing up \$100 million in ADB funds this year. Indeed, the GOS would have been better off not paying anything to the ADB unless it intended to clear its arrears fully. Given their payments thus far, the remaining payments are reasonable - just over \$1 million each month from July through November. AID will obtain assurances from the ADB on adequate GOS performance on the repayment plan before signing the Project Agreement.

The Project Agreement will include the following conditions precedent for disbursement for construction services:

Prior to disbursement under the Grant, or to issuance by A.I.D. of documentation pursuant to which disbursement will be made to finance construction services, the Grantee will, except as the parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.:

Evidence that (a) the Grantee and the African Development Bank (ADB) have signed an agreement for the ADB financing of the Kosti-Tendelti section of the road; (b) the Grantee and the ADB have agreed upon a plan for the Grantee to repay any arrearages to the ADB and (c) the Grantee is up to date on its repayments under such plan.

Evidence that all right-of-way and any necessary permits or other land rights exist for the road and for the land required for construction camps and workshops.

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Evidence that the plans, specifications and design standards for the Kosti-Tendelti section of the road are compatible with those for the Tendelti-El Obeid section of the road.

Evidence of the establishment of a Project Committee consisting of four to seven members to be composed of persons designated by A.I.D. in a Project Implementation Letter. The function of the Committee, except as otherwise agreed to by the parties, will be to oversee and guide contractual services, review project progress, review and approve offers, bids and contracts, and resolve administrative and technical problems and issues.

Covenants.

1. In the event that external financing for the Kosti - Tendelti portion of the road is cancelled, the Grantee covenants that it will provide, or cause to be provided, on a timely basis, sufficient funds to ensure completion of the road from Kosti to El Obeid in a manner satisfactory to A.I.D.
2. The Grantee will solicit A.I.D.'s views on the construction contractor for the ADB funded Kosti - Tendelti section of the road, as well as the contract itself, prior to award thereof.
3. The Grantee agrees to appoint approximately twenty-five qualified counterpart personnel for the (a) engineering consultant staff, (b) inspection laboratory, and (c) field lay-out staff. The Grantee will provide biographical data concerning the foregoing personnel to A.I.D. for review and comment prior to the award of the engineering services contract.

4. The Grantee agrees (a) to provide A.I.D. with a copy of the annual maintenance plan prepared and agreed to pursuant to the World Bank Third Highway Project, and (b) to consult with and discuss the plan with A.I.D., with opportunity to comment thereon.

5. In consideration of A.I.D.'s views of the importance and significance of the adoption and enforcement of vehicle size and axle-load regulations, the Grantee agrees to provide information to A.I.D. concerning these matters and to give A.I.D. the opportunity to consult with the Grantee.

6. The Grantee agrees to convene a meeting or conference annually for the Grantee and donors to the Sudan transportation sector. The purpose of the meeting/conference will be to review the Grantee's transportation sector policies.

7. The Grantee agrees to monitor the impact of project activities and construction on the physical environment and will implement recommendations made for safeguarding the physical environment surrounding the project area.

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TAGS:

SUBJECT: WESTERN AGRICULTURAL MARKETING ROAD, PROJECT 650-0069, ECPR/PP GUIDANCE

REF: STATE 17560

1. REPTTEL INFORMED USAID THAT ECPR APPROVED PID ON JANUARY 17, 1984. PARAGRAPHS BELOW PROVIDE ECPR GUIDANCE FOR PP DEVELOPMENT, AS DISCUSSED WITH S. MINTZ. THE COMMENTS ARE PRESENTED AS CONSTRUCTIVE SUGGESTIONS FOR PP DEVELOPMENT. MISSION IS COMMENDED FOR SUBMISSION OF LOGICAL, WELL-DEVELOPED PID. THE HIGH QUALITY OF PID WAS RECOGNIZED AND COMMENTED ON AT ALL LEVELS OF AID/W REVIEW.

2. THE FOLLOWING GUIDANCE FOR PP DEVELOPMENT EMERGED FROM THE ECPR DISCUSSION OF PID ISSUES:

A. ALTERNATIVES TO PROPOSED ROAD: THE SCALE OF THE PROJECT REQUIRES THAT ALTERNATIVES BE CLEARLY EXAMINED IN A VARIETY OF RESPECTS. THE FOLLOWING ALTERNATIVES WHICH WERE CONSIDERED SHOULD BE DESCRIBED IN THE PP AS WELL AS AN EXPLANATION OF WHY THEY WERE REJECTED.

(1) WHY WAS THIS PARTICULAR ROAD PROPOSED WHILE THERE ARE SO MANY OTHER ROAD REQUIREMENTS IN SUDAN?

(2) WHY THE PROPOSED LEVEL OF CONSTRUCTION (E.G., PAVING) WAS SELECTED WHEN COMPARED TO LESS COSTLY STANDARDS.

(3) WHY NOT CONCENTRATE ON IMPROVING THE RAILROAD?

IT WAS RECOGNIZED THAT SOME OF THESE POINTS WERE DISCUSSED IN PARTS OF THE PID OR FEASIBILITY STUDY. BUT THE ECPR RECOMMENDED THAT THE PROCESS OF ELIMINATING ALTERNATIVES BE DESCRIBED IN THE PP.

B. POLICY DIALOGUE: WHILE IT IS RECOGNIZED THAT PROJECTS SUCH AS THIS SUPPORT POLICY CHANGES BEING PURSUED IN OTHER WAYS, THE MISSION SHOULD EXAMINE FURTHER POSSIBILITIES FOR ADDITIONAL POLICY DIALOGUE.

FOR EXAMPLE, THE PROJECT COULD PROVIDE LEVERAGE TO SUPPORT A SELF-SUSTAINING SYSTEM OF ROAD MAINTENANCE THROUGH THE SPECIFIC APPLICATION OF ROAD USER CHARGES (TOLLS BEING PROPOSED FOR THE PROJECT ROAD). ADDITIONAL WAYS IN WHICH THE PROJECT COULD BE UTILIZED TO PROMOTE POLICY REFORM SHOULD BE DESCRIBED.

C. MAINTENANCE: THE ECPR EXPRESSED CONCERN OVER THE INSTITUTIONAL CAPABILITY OF THE RBPC TO MAINTAIN THE PROJECT ROAD. IT WAS RECOGNIZED THAT THE IBRD THIRD HIGHWAY PLAN WILL ADDRESS OVERALL MAINTENANCE CAPABILITY OF RBPC. ECPR URGES MISSION TO DEVELOP THE TECHNICAL ASSISTANCE AND MAINTENANCE EQUIPMENT SUPPORT IN THIS PROJECT IN A MANNER CONSISTENT WITH THE OVERALL MAINTENANCE SUPPORT PROVIDED TO RBPC BY THE THIRD HIGHWAY PLAN.

D. RECURRENT COSTS: THE PP SHOULD CONTAIN A THOROUGH RECURRENT COSTS ANALYSIS, PARTICULARLY FOR ROAD MAINTENANCE REQUIREMENTS. THE RECURRENT COSTS ANALYSIS SHOULD ALSO EXAMINE THE COSTS OF COLLECTING THE ROAD TOLLS THAT ARE PROPOSED FOR THE PROJECT ROAD AND THE EXPERIENCE WITHIN SUDAN REGARDING ENFORCEMENT/COLLECTION RATES ON OTHER TOLL ROADS.

E. INSTITUTIONAL CAPABILITIES: (1) THE ADMINISTRATIVE FEASIBILITY ANALYSIS OF THE PP SHOULD IN ADDITION TO MAINTENANCE CONCERNS IDENTIFIED ABOVE, ANALYZE THE INCREASING BURDEN OF A LARGE NUMBER OF NEW ACTIVITIES BEING PLACED ON RBPC. (2) WHILE THE MISSION HAS BEEN PLANNING ON UTILIZING HOST COUNTRY CONTRACTING MECHANISM, THIS SHOULD BE REEXAMINED DURING THIS ANALYSIS. DIRECT AID CONTRACTS FOR ROAD CONSTRUCTION ARE PERMISSABLE AND MAY BE EMPLOYED IF ANALYSIS INDICATES LACK OF HOST GOVERNMENT CAPABILITIES, EVEN WITH T.A./TRAINING. BOTH GOS AND USAID CAPABILITY TO MANAGE AND MONITOR PROJECT CONTRACTS SHOULD BE ASSESSED AND PROVISIONS MADE FOR STRENGTHENING SUCH CAPABILITY AS NECESSARY. THE CONTRACTING MODE QUESTION WILL ALSO BE IMPORTANT RELATIVE TO HOW FUNDING IS PROGRAMMED OVER THE PROJECT PERIOD.

F. UNIT COSTS: THE PP SHOULD VERIFY THE UNIT COSTS IDENTIFIED IN THE LOUIS BERGER ECONOMIC AND TECHNICAL REPORT TO BE SURE THEY ARE ACCURATE AND FORM A SOUND BASIS FOR 611(A) DETERMINATION.

G. OTHER DONORS: ADB FINANCING WILL HAVE TO BE ASSURED TO APPROVE THE PROJECT AS PRESENTLY STRUCTURED. ALTERNATIVELY, MISSION MAY WISH TO EXPLORE POSSIBILITY

WITH ADB OF FLEXIBILITY IN FINANCING PARTICULAR ROAD SECTIONS. AS CURRENTLY STRUCTURED, ADB WILL PRIMARILY FINANCE KOSTI-UM RAWABA AND AID WILL FULLY FINANCE UM RAWABA - EL OBEID. WOULD ADB CONSIDER REVERSING FINANCING ROLES? THIS WOULD ALLOW GREATER LIKELIHOOD OF AID PROJECT APPROVAL IF ADB FINANCING WERE NOT ASSURED IN TIMELY WAY.

H. IMPLEMENTATION PLAN: ECPR RECOMMENDS THAT PP DEVELOP A DETAILED IMPLEMENTATION PLAN INCLUDING A PERT CHART.

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I. CONTRACTING:

THE TENDER DOCUMENTS SHOULD BE REVIEWED TO ASSURE THAT SPECIFICATIONS ARE CONSISTENT WITH U.S. STANDARDS. IF IT IS NECESSARY TO REVAMP THE TENDER DOCUMENTS TO ENCOURAGE U.S. CONTRACTING, THE MISSION MAY WISH TO CONSIDER AN A AND E IQC FIRM TO DO SO.

J. EVALUATION PLAN: THE PP SHOULD IDENTIFY BENCHMARKS COVERING ECONOMIC, TECHNICAL, AND INSTITUTIONAL OUTPUTS WHICH WILL SERVE AS CONCRETE AND VERIFIABLE INDICATORS FOR EVALUATION PURPOSES. ONE SUCH BENCHMARK WOULD BE THE PROVISION THAT ROAD TOLLS ARE COLLECTED AND ACTUALLY USED FOR MAINTENANCE ON A CONTINUING BASIS. THE PLAN SHOULD ALSO INCORPORATE THE COLLECTING OF BASE LINE SOCIO-ECONOMIC AND OTHER DATA AGAINST WHICH THE REAL IMPACT OF THE PROJECT IN TERMS OF ITS GOAL-PURPOSE STRUCTURE CAN BE MEASURED IN THE FUTURE.

K. IEE: THE AFR BUREAU ENVIRONMENTAL OFFICE GAVE PROVISIONAL CONCURRENCE WITH THE IEE. HOWEVER, BEFORE FINAL CONCURRENCE IS PROVIDED, AFR/TR/SDP WILL REQUIRE:

(1) REVIEW BY AFR/TR/SDP OF THE DETAILED SCOPE OF WORK FOR THE ENVIRONMENTAL REVIEW BEFORE APPROVAL OF THE PP.

(2) REVIEW OF A DETAILED SCOPE OF WORK FOR THE MONITORING PHASE; AND

(3) AFR/TR/SDP APPROVAL OF THE FINAL ENVIRONMENTAL REVIEW DOCUMENT.

(4) AFR/TR/SDP ALSO REQUIRES THAT ALL APPROPRIATE DESIGN CONSIDERATIONS DESCRIBED IN THE DOCUMENT "ENVIRONMENTAL DESIGN CONSIDERATIONS FOR RURAL DEVELOPMENT PROJECTS" BE FULLY ASSESSED DURING THE ENVIRONMENTAL REVIEW UNDER DIRECTION OF REO. THE REVIEW SHOULD INCLUDE A SOCIAL SCIENTIST WITH EXPERIENCE IN ASSESSING SOCIOECONOMIC IMPACTS OF ROAD CONSTRUCTION ON BOTH THE ENVIRONMENTAL REVIEW AND MONITORING TEAMS.

L. MAP: IT WAS REQUESTED THAT THE PP INCLUDE AN ADEQUATE PROJECT MAP WHICH SHOULD BE A TOPOGRAPHICAL BASE MAP OF THE LARGEST PRACTICAL SCALE WITH THE PROPOSED ROADWAY; VILLAGES, TOWNS AND CITIES; STREAMS;

RAILROAD AND OTHER INFRASTRUCTURE FACILITIES; AND
GENERAL SOILS TYPES, VEGETATIONAL PATTERNS, AND
ECOLOGICAL ZONES, AS PRACTICABLE.

3. FYI: AFR/DP RAISED POSSIBILITY OF PROP IN MISSION
FY 1985 DA OYB TO FY 1984 LEVEL IF AGENCY ON CONTINUING
RESOLUTION IN FY 1985. IF THIS SHOULD BE THE CASE,
MISSION SHOULD CONSIDER FOREGOING PROJECTED FY 1985 NEW
PROJECT START, KORDOFAN RAINFED AGRICULTURAL GRANT, TO
ASSURE SUFFICIENT AND TIMELY FINANCING OF SUBJECT
PROJECT AS WELL AS PROJECT 652-0060, FY 1984 STARTS.
END FYI.

4. AID/W LOOKS FORWARD TO MISSION SUBMISSION OF PP FOR
REVIEW AND APPROVAL. SHULTZ
BT
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Logical Framework
Western Sudan Agricultural Marketing Road
Project No. 650-0069

Project Title: _____

DEVELOPMENT HYPOTHESES

If Purpose, Then Goal

If Outputs, Then Purpose

MANAGEABLE INTEREST

If Inputs, Then Outputs

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS
<p>Program Goal: The broader objective to which this project contributes: To increase production and incomes in the rainfed ag. section of western Sudan and to increase Sudan's export earnings.</p>	<p>Measures of Goal Achievement: 1. Increased total production in Kordofan. 2. Increased sale of agricultural/livestock products. 3. Increased production of cash crop for export market. 4. Expanded acreage under cultivation</p>
<p>Project Purpose: To provide and maintain an efficient, all-weather marketing road linking W. Sudan to national and international markets.</p>	<p>Conditions that will indicate purpose has been achieved: End of project status: 1. Existence of road adequately serving projected traffic loads. 2. Traffic counts indicate increased use of route since completion of construction. 3. Toll revenues cover maintenance costs. 4. Provisions for maintaining interlinking transport network are established.</p>
<p>Outputs: 1. Road construction. 2. Road maintenance program. a. Trained equipment and road maintenance staff. b. Fully equipped and efficiently running maintenance camps. c. Regularly scheduled maintenance.</p>	<p>Magnitude of Outputs necessary and sufficient to act: 1. 301 kilometers of all-weather road constructed. 2. Two maintenance units operating effectively.</p>
<p>Inputs: Activities and Types of Resources: 1. Technical assistance for road constructor and engineering supervision. 2. Technical assistance to establish maintenance shop. 3. Commodities. a. Road maintenance equipment. b. Shop equipment. 4. Training.</p>	<p>Level of Effort/Expenditure for each activity: 1. Road construction/engineering supervision contracts. (181 om) (\$4.7) 2. Technical assistance contracts. (24 pm) (\$120)/ 3.a. Road construction equipment (\$ 1.0m). b. Shop equipment. c. Maintenance equipment (\$660.).</p>

MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<ol style="list-style-type: none"> 1. Regional and Central Ministry of Agr. Records. 2. GOS Trade Statistics. 	<p>Concerning long term value of program/project: Sudan finds and maintains sufficient markets for its primary ag. products from Kordofan region.</p>
<ol style="list-style-type: none"> 1. Project Evaluation. 2. Site inspection. 3. Ministry of Transport and Communications and RBPC records. 4. Continuing dialogue with RBPC. 	<p>Affecting purpose-to-goal link:</p> <ol style="list-style-type: none"> 1. Decreased transportation costs will translate into higher farmgate prices. 2. More farmers willing to increase production and enter commercial market. 3. Trucking industry remains competitive. 4. Fuel and spare parts will not be a constraint to increasing truck haulage.
<ol style="list-style-type: none"> 1. Site inspection. 2. Contractor reports. 3. Project evaluation. 4. Spare parts inventory records. 	<p>Affecting output-to-purpose link:</p> <ol style="list-style-type: none"> 1. Operations of the railroad will not pose a significant competitive alternative to the road. 2. Adequate maintenance staff from RBPC will be assigned to road.
<ol style="list-style-type: none"> 1. Actual contract review. 2. PIO/Ts. 3. Site inspections. 4. PIO/Cs. 5. MOT&C and RBPC assign people to project. 	<p>Affecting input-to-output link:</p> <ol style="list-style-type: none"> 1. ADB and Norwegian Govt. inputs will be timely.

5C(2) PROJECT CHECKLIST

Listed below are statutory criteria applicable generally to projects under the FAA and project criteria applicable to individual funding sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Economic Support Funds.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

Country checklist updated for Sudan Program Assistance Approval Document (PAAD) Petroleum Instiative Commodity Import Program Grant. April 4, 1984.

A. GENERAL CRITERIA FOR PROJECT

1. FY 1982 Appropriation Act Sec. 523; FAA Sec. 634A; Sec. 653(b).

a. Describe how authorizing and appropriations committees of Senate and House have been or will be notified concerning the project;

Congressional Notification was submitted on July 30, 1984 and has expired on August 14, 1984.

b. is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$1 million over that amount)?

Yes

2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000 will there be (a) engineering, financial or other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

(a) Yes

(b) Yes

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance? No further legislative action is required.
4. FAA Sec. 611(b); FY 1982 Appropriation Act Sec. 501. If for water or water-related land resource construction, has project met the standards and criteria as set forth in the Principles and Standards for Planning Water and Related Land Resources, dated October 25, 1973? N/A
5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project? Yes
6. FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. Project is regional in scope and involves multilateral donor financing.

7. FAA Sec. 601 (a).
Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; and (c) encourage development and use of cooperatives, and credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce, and (f) strengthen free labor unions.

The goal of the project is specifically to encourage international trade by providing an all-weather road network to Port Sudan. Lower transportation cost will encourage competition among truckers. The project is part of an overall USAID strategy in rainfed agriculture area. The strategy includes transportation, research, storage and credit facilities.

8. FAA Sec. 601(b).
Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

U.S. Technical assistance and commodities will be used.

9. FAA Sec. 612(b), 636(h);
FY 1982 Appropriation Act Sec. 507. Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.

See financial plan. Local currency generated through the Commodity Import Program will be used in lieu of U.S. dollars to finance local costs. The award of the construction contract will favor utilization of local currency.

10. FAA Sec. 612(d) Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release? No
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise? Yes
12. FY 1982 Appropriation Act Sec. 521. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity? N/A
13. FAA 118(c) and (d). Does the project take into account the impact on the environment and natural resources? If the project or program will significantly affect the global commons or the U.S. environment, has an environmental impact statement been prepared? If the project or program will significantly affect the environment of a foreign country, has an environmental assessment been prepared? Does the Yes

project or program take into consideration the problem of the destruction of tropical forests?

14. FAA 121(d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (dollars or local currency generated therefrom)?

N/A

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b), 111, 113, 281(a). Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward

An all weather road will lower transportation costs and result in higher income for farmers. It will also open the area to agricultural inputs and social services. The project is part of an overall strategy including agriculture research, regional planning, storage and credit facilities.

better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

b. FAA Sec. 103, 103A, 104, 105, 106. Does the project fit the criteria for the type of funds (functional account) being used?

Yes

c. FAA Sec. 107. Is emphasis on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)?

This being a major road project through a sparsely populated area can best utilize mechanical construction methods.

d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)?

N/A Sudan is a RLDC. However, Sudan is contributing at least 25% of the cost of the program but from CIP generated local currency not from budgeted funds.

e. FAA Sec. 110 (b).
Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?

N/A
Sudan is an RLDC.

f. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?

Yes

g. FAA Sec. 281(b).
Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.

Development of the road network will encourage and allow economic and social integration. The technical assistance provided by the project will contribute towards institutionalizing and improving the capabilities of road building and maintenance.

2. Development Assistance Project
Criteria (Loans Only).

N/A

a. FAA Sec. 122(b).
Information and conclusion on capacity of

the country to repay the loan, at a reasonable rate of interest.

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

N/A

c. ISCA of 1981, Sec. 724 (c) and (d). If for Nicaragua, does the loan agreement require that the funds be used to the maximum extent possible for the private sector? Does the project provide for monitoring under FAA Sec. 624(g)?

N/A

3. Project Criteria Solely for Economic Support Fund

a. FAA Sec. 531(a). Will this assistance promote economic or political stability? To the extent possible, does it reflect the policy directions of FAA Section 102?

N/A

b. FAA Sec. 531(c). Will assistance under this chapter be used for military, or paramilitary activities?

c. FAA Sec. 534. Will ESF funds be used to finance the construction of the operation or maintenance

of, or the supplying of fuel for, a nuclear facility? If so, has the President certified that such use of funds is indispensable to nonproliferation objectives?

d. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?

5C(3) - STANDARD ITEM CHECKLIST

Listed below are the statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed?

Procurement will be on competitive basis.

2. FAA Sec. 604(a). Will all procurement be from the U.S. except as otherwise determined by the President or under delegation from him?

Yes. U.S., 941 Countries and Sudan.

3. FAA Sec. 604(d). If the cooperating country discriminates against marine insurance companies authorized to do business in the U.S., will commodities be insured in the United States against marine risk with such a company?

Yes

4. FAA Sec. 604(e); ISDCA of 1980 Sec. 705(a). If offshore procurement of agricultural commodity or product is to be

N/A

financed, is there provision against such procurement when the domestic price of such commodity is less than parity? (Exception where commodity financed could not reasonably be procured in U.S.)

5. FAA Sec. 603. Is the shipping excluded from compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S. flag commercial vessels to the extent that such vessels are available at fair and reasonable rates?

No

6. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished by private enterprise on a contract basis to the fullest extent practicable? If the facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?

Yes

7. International Air Transport. Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will U.S. carriers be used to the extent such service is available? Yes
8. FY 1982 Appropriation Act Sec. 504. If the U.S. Government is a party to a contract for procurement, will the contract contain a provision authorizing termination of such contract for the convenience of the United States? Yes

B. Construction

1. FAA Sec. 601(d). If capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interests? Yes
2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable? Yes
3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed \$100 million? Will not exceed \$100 million.

C. Other Restrictions

1. FAA Sec. 122(b). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter? N/A

2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights? N/A

3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the communist-bloc countries? Yes

4. Will arrangements preclude use of financing:
 - a. FAA Sec. 104(f); FY 1982 Appropriation Act Sec. 525: (1) To pay for performance of abortions as a method of family planning or to motivate or coerce persons to practice abortions; (2) to pay for performance of involuntary sterilization as method of family planning, or to coerce or provide financial incentive to any person to undergo sterilization; (3) to pay for any biomedical research which

relates, in whole or part, to methods or the performance of abortions or involuntary sterilizations as a means of family planning; (4) to lobby for abortion?

b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property? Yes

c. FAA Sec. 660. To provide training or advice or provide any financial support for police, prisons, or other law enforcement forces, except for narcotics programs? Yes

d. FAA Sec. 662. For CIA activities? Yes

e. FAA Sec. 636(i). For purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained? Yes

f. FY 1982 Appropriation Act, Sec. 503. To pay pensions, annuities, retirement pay, or adjusted service compensation for military personnel? Yes

g. FY 1982 Appropriation Act, Sec. 505. To pay U.N. assessments, arrearages or dues? Yes

h. FY 1982 Appropriation Act, Sec. 506. To carry out provisions of FAA section 209(d) (Transfer of FAA funds to Yes

multilateral
organizations for
lending)?

i. FY 1982 Appropriation
Act, Sec. 510. To
finance the export of
nuclear equipment, fuel,
or technology or to train
foreign nationals in
nuclear fields?

Yes

j. FY 1982 Appropriation
Act, Sec. 511. Will
assistance be provided
for the purpose of aiding
the efforts of the
government of such
country to repress the
legitimate rights of the
population of such
country contrary to the
Universal Declaration of
Human Rights?

Yes

k. FY 1982 Appropriation
Act, Sec. 515. To be
used of publicity for
propaganda purposes
within U.S. not
authorized by Congress?

Yes

The Director,
US AID, Khartoum.

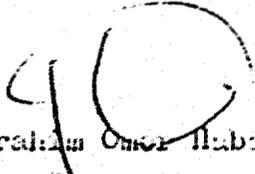
Dear Sir,

Subject:- Kosti - Umm Rawaba - El Cheid Road

This is to inform you that the Kosti-Umm Rawaba- El Cheid Road is one of the high priority projects which play a central role in the nation's development plan.

We kindly ask you to provide us with a grant of 90million U.S. dollars to assist us in the implementation of this project.

Sincerely,

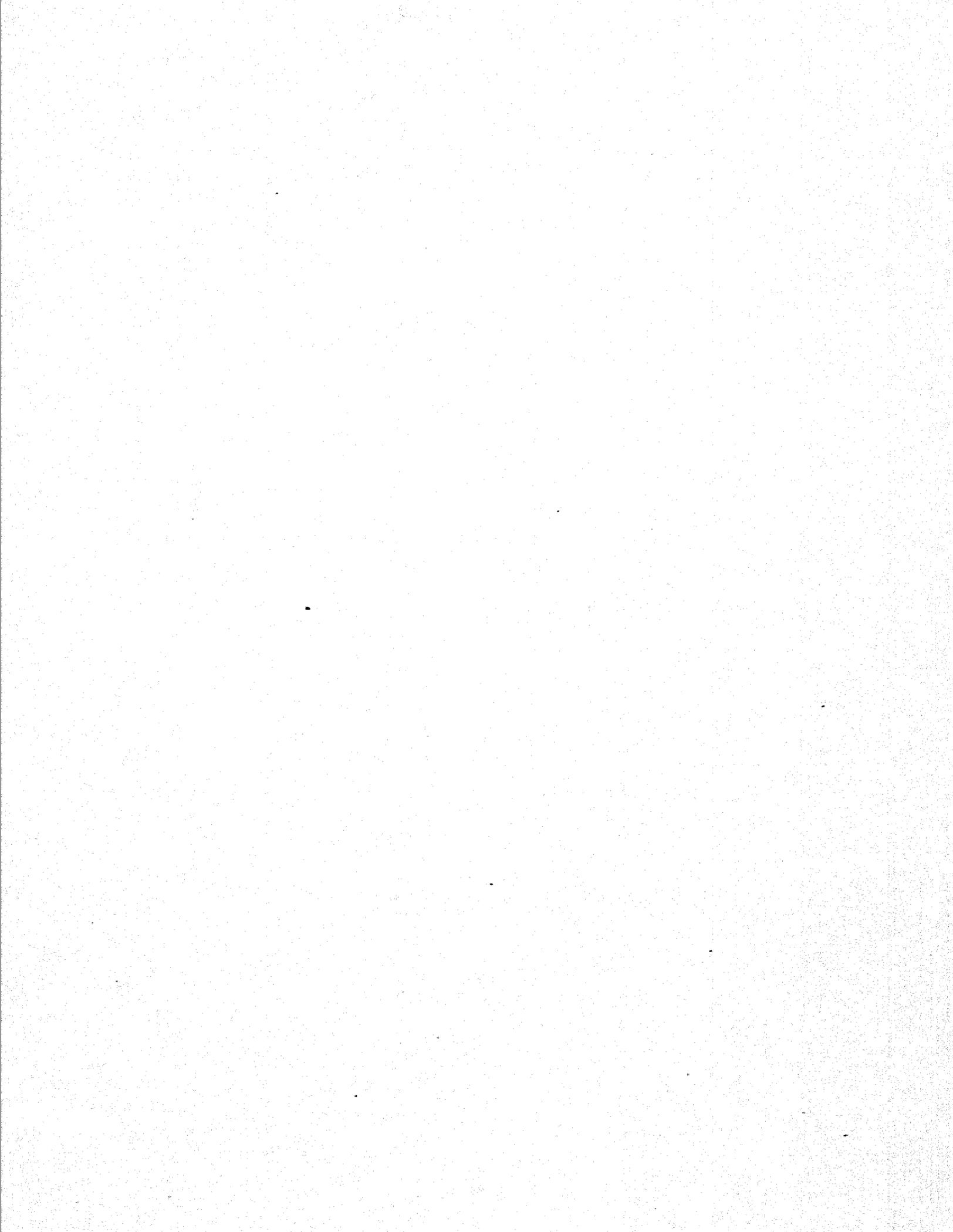

Ibrahim Omar Habani
Acting Under Secretary of Planning,
Ministry of Finance and Economic Planning.

c.c.

Director,
Roads and Bridges Corporation.

Best Available Copy

.. / Amira.



Sudan: Western Agricultural Marketing Road Project (650-0069)

611(e) Certification

The Western Agricultural Marketing Road project consists of constructing and maintaining a 301 kilometer all-weather road from Kosti to El Obeid. The project road will connect at Kosti to the national paved road network linking the rainfed agricultural area of Kordofan to national markets in Khartoum and international markets via Port Sudan.

The project will be constructed in two sections. The first section, from Kosti to the Tendelti area, a distance of 116 kilometers, will be financed by the African Development Bank (ADB) and the Norwegian Government. The second section from the Tendelti area to El Obeid, a distance of 185 kilometers, will be financed by AID. AID will also finance the maintenance component. The GOS will provide the local currency requirements for the entire project, primarily from PI480 Title III-generated local currency.

The project will be implemented by a host country contract between the Roads and Bridges Public Corporation (RBPC) and the construction contractor. The engineering services to prepare the construction designs and supervise construction will be provided by a host-country contract between the engineering firm and the RBPC. RBPC will provide counterpart personnel to the supervising engineering firm in addition to the field layout, inspectors and laboratory's personnel. RBPC has qualified staff to assign to the Project.

The GOS has determined that the road will be a toll road. An analysis of the projected tolls shows that tolls will be sufficient to finance future routine maintenance costs. During the life of the project, the GOS and the World Bank will be implementing the Third Highway Project, which focuses specifically on improving the RBPC's maintenance capabilities. Assistance will also be provided to help the GOS in identifying maintenance costs and sources of funds to finance road maintenance. It is expected that by the time the Kosti-El Obeid road is completed, the GOS will be financing all road maintenance from road user fees.

With the assistance described above, I hereby certify that the Government of Sudan has the financial and human resources to implement and maintain the project successfully and effectively .



William R. Brown
Director, USAID/Sudan

26 June 1984
Date

Technical AnalysisA. Technical Analysis

The road, as planned, runs for 301 kilometers NW from the commercial hub of Kosti on the White Nile river to the regional marketing center of El Obeid.

The alignment follows the northern, downstream side of the railway until a point near El Obeid where the road crosses the railway. On this alignment, major drainage requirements are defined by existing structures in the railway embankment. Drainage needs occurring between those structures will be met by occasional pipe culverts for minor cross drainage.

This road is designed according to the staged construction techniques whereby the pavement is initially constructed to a standard suitable for carrying 0.5 million standard axles per lane and later strengthened by an asphalt overlay to extend the design life up to 20 years. This approach allows for the efficient use of the available funds as well as the analysis of the actual traffic, once the road is open, to verify the accuracy of the traffic predictions and the determination of the optimal time for overlay construction. In this respect, the studies project the ADT of this road to start with 360 vehicles in the year of opening and reach 910 vehicles after 20 years whereas the crosspending cumulative standard axels per lane start at 45,725 per lane in the year of opening and reach 1,394,763 per lane at the end of the project life. The geometry of curver and grades provides for nominal speeds of 100 kph over 55% of the route (the 166 km of plain westward of Kosti) and 80 kph over 45% of the route (the 135 km of rolling terrain westward from Umm Ruwaba).

The soils over the first 166 kilometers from Kosti have many clay lenses while the soils over the last 135 kilometers westward from Umm Ruwaba predominate in sand and gravel. The plain above Kosti has only a few, outcrops of heavy granular material or stone and these are at fairly lengthy haul distances from the road alignment. The design engineer (NORCONSULT) had proposed to obtain the required strength of pavement structure through stabilization of locally available materials by the mixture of portland cement over the 166 km. stretch above Kosti. The pavement structure over the last 135 km westward from Umm Ruwaba would utilize local materials without the need for stabilization. This strategy on materials was reflected in the Berger report and in the PID. Information subsequently available (See Section B of this Annex) has indicated that cement stabilization could not reasonably be expected to yield the results indicated by the design engineer. The alternative is a higher first cost solution involving the long haul and placement of acceptable natural or crushed granular materials. This alternative solution has now been costed in the construction estimates for the 166 km section above Kosti. This represents a projected increase of FX\$ 5 million and LC\$ 3 million equivalent in the cost of the road.

The road in typical cross-section has an embankment width of 10 meters, consisting of two 1.5 meter shoulders and two traffic lanes of 3.5 meters each. The average embankment height is 0.60 meters. The pavement structure

extends across the whole width with the shoulders receiving a stabilizing bituminous coating. The traffic lanes will receive a double bituminous surface treatment wear course. In such a wear course, the compacted crushed stone subbase is evenly sprayed with asphalt, over which a thin layer of crushed stone chips is spread, followed by another even spraying of asphalt and rolling. This treatment effectively seals the top of the pavement against damaging intrusion of rainwater and interlocks the stone chips in the surface wear course so that they are retained in place under the abrading action of vehicular wheels. The type of asphalt used and the rate of application are crucial to the success of the wear course.

Short access roads will be built to link the market towns enroute (Umm Ruwaba and El Rahad) to the trunk road as it passes nearby. Drainage structures will be pipe culverts, box culverts, and bridges with protection from erosion during flash floods provided by footings and wing-walls.

The construction contractor will need to build adequate work camps in the region to house his workers, RBPC staff, and the consulting engineer team. The consulting engineer will design facilities at Umm Ruwaba, El Rahad, and El Obeid which will be suitable for the contractor work camps and which will also meet the needs of subsequent road maintenance. He will also identify several points along the route where bore holes will be drilled to obtain water for compacting of earthworks. Where the quality of water permits, these boreholes will be developed and left for public use.

The construction of the road is planned to be done in two separate and contiguous sections, with the ADB funding the first section construction from Kosti to the Tendelti Area, a distance of 116 kms; supported by the Norwegian funding of the engineering services; and AID funding both the construction and engineering services for the second section, the remaining 185 kms running from Tendelti Area to Umm Ruwaba, El Rahad to El Obeid.

The actual lengths to be undertaken under AID or ADB financing and, therefore, the point of juncture, will be determined from contract prices and will vary from the nominal distances noted above. The conditions of contract will provide the RBPC with the right to amend quantities for that purpose.

The estimated cost of the AID funded approximately 185 kms of road, as developed by the Berger report, is \$79.6 m, consisting of two components: (1) engineering services of \$5.8 m, (FX \$5.1 m, LC \$.7 m) (2) construction services of \$73.8 m (FX \$51.9 m, LC \$21.9 m). A road maintenance component for the entire road (301 km) is estimated to cost \$3.54 m (FX \$2.63 m, LC \$.9). The project is estimated to require five years and nine months time to implement, (August, 1984 - April, 1991) including the time required for acquisition of engineering and construction services. Actual construction time is estimated to require 50 months, consisting of a 6-month mobilization, and 44 months of construction. This is followed by a 12-month period of maintenance by the contractor. Technical assistance and equipment will be furnished to the RBPC prior to the expiry of the construction contractor's responsibility for maintenance. The technical assistance to maintenance will run for a nominal 12-month period subject to recommendations emerging from studies nearer to that time.

Although extensive and competent engineering design work has already been accomplished, the consulting engineering firm to be employed for the construction phase must first attend to these several additional needs in order to have an acceptable group of bidding documents for release to a group of prequalified bidding firms:

1. Revision of cross section and profile sheets to cover reductions in embankment width and grades as proposed by Berger and reflected above.
2. Revision of details to note certain protection of paving edge proposed by Berger.
3. Amendment of the structural notation to replace all cement-stabilized materials with natural or crushed stone materials.
4. Add design for link roads to the two market centers.
5. Design of three maintenance compounds.
6. Modification of bills of quantities.
7. Up-dating cost estimate.
8. Amendment/re-write of contract format to FIDIC/U.S. norm, and including conditions special to AID and to the Sudan.

The RBPC does not at present have the capacity in the project region to maintain the project road nor the other roads planned or built in the region. Both the IBRD and AID are actively engaged with the GOS/RBPC in projects designed to develop the capacity to maintain the primary road network. A road maintenance component is appropriately addressed in this project and provides the RBPC with the physical capacity to keep the road operative. Given the larger goal of intra-regional transportation development, the project consulting engineer will carry out a study in 1988 which will address a moderate-term plan for regional road maintenance needs in correlation with efforts in that direction by the IBRD and the RBPC. The maintenance component of this project will be coordinated with that plan, which at this time is projected for AID consideration in continuing assistance in intraregional transportation.

During the first two years after the road is opened to use, RBPC's tasks in maintenance will be minimal. In the first of those two years the contractor will have primary responsibility. In the second year the RBPC will have inputs from the two-man technical assistance team in organizing its work program and in training its crews and contractors.

The Berger report reasonably outlines the maintenance requirements. Periodic schedules will be drawn for routine clearance of vegetation and shaping of the embankment slopes and side ditches by motor grader. A crew will routinely visit each drainage structure prior to the rainy season to hand-

remove clogging material and debris; the debris will be burned. Other work will have to be scheduled during each dry season as it occurs. This includes the repair of potholes and cracking with on-site hot asphalt mix. Shoulders must also be cleared of debris, scrap iron, and other obstacles as they occur. Shoulder surfaces will deteriorate as a result of erosion and heavy vehicle passage. These will need periodic additions of material and respraying. Abrasion and extensive cracking of the traffic lanes will require periodic single or double surfact treatment. As the engineering reports bring out, there finally comes a time, normally at the accumulated passage of 500,000 standard axles, when the cost of repairs is excessive and a heavy duty overlay of asphaltic concrete should be undertaken. This is projected to occur ten years after the road is opened to traffic.

An equipment package will be defined by the consulting engineer in his regional maintenance study, to be left with the RBPC to assume its maintenance responsibilities on the 300 km project road. This equipment will be procured with the assistance of the consulting engineer or the contractor and supported by the facilities in the maintenance compounds/workshops.

B. Cement-Treated Base Sub-base Road Construction Materials

Summarized below are the key points and conclusions of a Sayed Bedawi S. Laz report, dated April 7, 1984 on experience in Sudan with the stabilization of sub-standard materials with cement, lime and bitumin. The study was initiated by USAID to investigate the feasibility of cement-treated bases as was recommended by NORCONSULT for the Kosti/Umm Ruwaba section of the project road. The report is available from USAID/Sudan.

SUMMARY

- (1) Cement stabilization was only used once in the Sudan for the construction of 15 cm base on the Wad Medani - Gedaref Road. The base course, with D.S.T. surfacing failed to stand traffic, and was overlaid with about 25 cm of asphalt macadam and asphalt concrete.

Cement stabilization subbase tender items in the Kassala - Haiya contract were deleted and replaced by a granular subbase course.

Locally produced cement is not always available in the market, where it is sold for about LS 300/ton. Imported cement is available at about LS 260 per ton.

- (2) Bituminous stabilized base, 20 cm, on the Khartoum - Wad Medani Road did not stand traffic, was abandoned, and replaced by a gravel base.

Similarly the contract items for the asphalt stabilized base course in the Kassala - Haiya Road were deleted and replaced by a crushed stone and gravel base.

- (3) 15 cm thick lime stabilised base course, on 55 km of Wad Medani - Sennar - Kosti Road, with 5 cm asphalt concrete surfacing, is working well.

- (4) The construction of a cement-stabilised base or subbase course requires much higher skills and attention than is required for other types of construction. In Sudan's dry, hot climate, the mixing, pulverization and compaction operations must be completed in a short time without delay, which may be difficult to guarantee in the field. Proper curing may also be very expensive in Kosti - Umm Ruwaba area, requiring long haulage of water, a bituminous seal, and closing the road from traffic, cattle, etc.

CONCLUSIONS

In the short history of road construction in the Sudan, repeated attempts have been made to economize in road design and construction by stabilization of sub-standard materials with cement, lime, and bitumin. All cases have proved to be failures, with the sole exception of lime stabilisation on the Wad Medani - Sennar - Kosti Road. In this instance the material stabilized with the addition of 4.5 percent lime was a very high quality lateritic gravel with an estimated CBR of between 40 to 60 percent and was surfaced with 5 cm of asphaltic concrete.

Failure of the Wad Medani - Gedaref base was blamed on increased traffic, but the size, nature and thickness of overlays provided are not justified by considerations of traffic alone. Almost certainly in-situ CBR's (not recorded in reports) were deficient and general experience has shown that cement-stabilized bases, with economic cement content, surfaced with surface dressing only have a relatively short life before asphaltic concrete overlay becomes necessary.

Preparation of a model specification for soil-cement stabilization on the Kosti - El Obeid Road is undesirable at this time and can not be recommended on the following grounds:

- Need for relatively high cement ratios in the field vis-a-vis laboratory results;
- High cost of cement on the market;
- High risk of an early and expensive overlay; and
- High level of skill and quality control required for field stabilization operations.

The report recommends a re-examination of available rock and gravel sources, transport haulage costs, and updating design estimates to accommodate current cement prices and water haulage costs.

ECONOMIC ANALYSIS

1. The Surface Transport System

The importance of the Kosti-El Obeid paved road needs to be viewed in the context of the actual and planned evolution, from the late 19th through the early 21st century, of a national transportation network in a vast and impoverished country with widely separated population and production centers. Initial transport investment through the colonial era was in the railroad and, where appropriate, the river^{1/}. Roads were considered as feeders to the railroad. The railroad, whose initial tracks were laid in the 19th century for military purposes, was extended well into the 20th century to provide long haul economics for bulk commodities. This pattern of road development as feeders to the railroad is still visible in today's multi-modal surface network especially the Kadugli-Dubeibat, Nyala-El Fasher and Nyala-Zalingei isolated road segments.

Today, the railroad maintains some advantages in long haul bulk commodities but is beset with physical capacity constraints, mammoth investment needs and presently insoluble management problems noted elsewhere in this paper.

The result is that the existing highway loop (Khartoum-Wad Medani-Sennar-Gedaref-Kassala-Port Sudan) and associated spurs (Sennar-Damazin, Sennar-Kosti), which follow the railroad but offer more flexible and competitive road haulage, take an increasing percentage of total traffic. The railroad etched out the best routes between population centers and through the principal agricultural areas. The paved roads now follow the same corridors.

The evolution of the present system was not haphazard, but relatively well planned. In 1968, Lockheed International, under contract to AID, prepared an intermodal study, still based on long haul railroad dominance. The Kosti-El Obeid road was the only road project listed among the study's 35 project recommendations, even though it paralleled the railroad.

In 1974, a consultant team of US-trained Arab specialists developed a three phase master plan for Sudan's transport system. Many economic planning initiatives in Sudan have progressed by fits and starts and have been abandoned after considerable investment. Paved road construction by contrast closely followed the Phase I recommendations. With paving of the

1/ The river remains an underutilized pathway between the north and south of Sudan, where distances and terrain preclude paved road connections for the foreseeable future. AID, other donors, and Sudan's private transporters are prepared to move ahead on river transport when conditions are suitable.

Khartoum-Gezira-Kassala-Port Sudan route and spurs, Phase I construction is completed. The Kosti-El Obeid corridor is the highest priority in Phase II.

Very simply, this is a road for now, and for the 21st century. The project road opens up the west, the regional focus of USAID's strategy. From the road, rail, river and future pipeline gateway of Kosti, the project road reaches El Obeid, a regional capital unserved by paved road. There are onward connections already completed or planned from El Obeid. The project road connects with the Dutch-assisted all-weather road (shortly to be paved) from El Obeid south to Dubeibat and onward by already paved road to Kadugli, South Kordofan's provincial seat serving the adjacent rainfed traditional and mechanized farming areas. Additional improved roads south to Talodi will open up poorly served but fertile areas west of the Nile. Pending feasibility studies, a link to the evolving all-weather net in the southern Sudan is a future possibility^{1/}. El Obeid is also the jumping off point for areas further west. Improvements on the road to En Nahud, North Kordofan Province seat and a principal groundnut exporting center, are under discussion. From En Nahud additional links westward are already constructed or are in various stages of planning. With paving to El Obeid, the western stock route proposed by IFAD could terminate near El Obeid for eastward movement by truck to Khartoum and Port Sudan for export.

All of these improvements make sense economically and in terms of the transport system only if the Kosti-El Obeid road is paved for its entire length to capture the full flow of user, agricultural and balance-of-payments benefits.

2. Specification of Benefits

The nature of induced agricultural benefits are summarized in the PID and specified in Ch. V of the Berger Report. The rationale for relying solely on user benefits in the economic analysis is presented in Section VI. B. The nature of user benefits include:

- (a) Vehicle operating cost savings per ton/km of freight (fuel consumption, tire and parts wear, and general vehicle depreciation, each with a foreign exchange component);
- (b) Cost and time savings of both diverted and generated traffic applied to induced incremental agricultural production where such production is now constrained by low transport capacity, high cost and spoilage;
- (c) Passenger time and cost savings.

1/ The Talodi-Malakal and Kosti-Renk-Maiakal routes both pass through swampy terrain where road construction would be prohibitively expensive relative to the existing river or rail spur to Wau. However, from Malakal an improved road will eventually follow the line of the Jonglei canal to Bor. The Bor-Juba link has already been improved by the Dutch. Improvements are proceeding on the "Main Street" of the south from Wau through Juba to the Kenyan border.

The benefits stream used in the economic analysis assumed:

- (a) The entire road is paved and well maintained; and
- (b) Fuel shortages are not a constraint.

The material which follows summarizes the Berger Economic Reappraisal.

3. Normal Road Traffic, Trends, and Projections

Base figures for present levels of road traffic were difficult to produce, despite various published and unpublished traffic counts, because of the inconsistencies in survey techniques and in the locations of survey stations. Using the same primary data, the project team drew conclusions which differed from those drawn by one of the previous consultants, but the team took pains to interpret all data in a consistent manner.

It has been assumed that all of the traffic presently traversing the desert between the project area and Khartoum would be diverted to the project road. While in some cases this means a longer (distance) trip, in all cases the trip would cost less and would take significantly less time. The traffic figures extracted from various sources therefore include this diverted traffic. These figures are then subjected to two adjustments which depend upon the month and the year the figures were recorded. The first adjustment accounts for seasonal variations in freight shipments (based upon Sudan Railway Corporation (SRC) records) during the year. The second adjustment accounts for the seasonal migration of laborers east through the project area in November/December, and west in March/April. In other words, if the traffic was counted during one of these periods, it could be assumed to include about 20 ADT (average daily traffic) due to migrant labor which was therefore adjusted to about 3 AADT (annual average daily traffic), which considers the migrant labor ADT on an annual average basis. These adjustments caused only minor changes in AADT figures, a total of less than 7% in the most extreme case.

Finally, because AADT figures still showed few consistent trends, they were weighted more heavily if they were more recent. Full reliance could not be placed upon at least one of the recent surveys in light of certain oversights in other related parts of the document. The following table summarizes these calculations.

BASE AADT ON PROJECT ROAD

	(9)	(13)	(1)	(10)	(12)	(6)
<u>El Obeid-Umm Ruwaba</u>	<u>May</u> <u>1977</u>	<u>April</u> <u>1982</u>	<u>Sep.</u> <u>1983</u>	<u>Nov/Dec.</u> <u>1977</u>	<u>Feb.</u> <u>1981</u>	<u>Dec.</u> <u>1982</u>
Survey traffic plus diverted desert traffic	170	235	201			
Adjustments	-8	-15	+3			
Total AADT	162	220	204			
Weighted AADT 10/83			211			
<u>Umm Ruwaba-Tendelti</u>						
Survey traffic plus diverted desert traffic				201	203	288
Adjustments				-9	-11	+3
Total AADT				193	192	291
Weighted AADT 12/82						252
<u>Tendelti-Kosti</u>						
Survey traffic plus diverted desert traffic				286	200	291
Adjustments				-6	-11	+3
Total AADT				280	189	294
Weighted AADT 12/82						253

The table reveals a 4 percent historic annual growth rate in traffic between El Obeid and Umm Ruwaba, which could be expected to continue until the new road is constructed. Umm Ruwaba-Tendelti traffic shows a 5 1/2 percent annual increase. Despite the weighting of total base AADT, this growth rate seems to be largely the result of traffic related to the exceptional harvest of 1982, and it is felt that a 4 percent growth rate projected here too would be more realistic. The traffic between Tendelti and Kosti shows a decline from the unexplainably high reading of 1977, but traffic volumes since the beginning of 1981 have been right in line with Umm Ruwaba-Tendelti traffic, so the 4 percent rate is likewise projected here.

4. Diverted Traffic

In addition to the traffic diverted from desert routes to the new road, it may be conservatively assumed that 10 percent of the railway passengers will shift to road travel in the year following completion of construction, cutting their travel time by over 50 percent for a fare that is highly competitive. It would be dangerous to assume a greater diversion of passengers since a greater number of passengers could easily exceed the passenger carrying capacity of the vehicles on the new road. It should be noted, however, that present passenger fares by truck are very close to 3rd class train fares, which have been increasing 30-40 percent per year recently. Travel time is about the same for long trips. However, with a new road, truck travel time will be reduced considerably, and with a corresponding decrease in fares, passenger travel by trucks will become even more competitive.

With the opening of the road, further diversions will be noticed. Some passengers will shift from medium-sized trucks to buses, passenger cars, and pickups. Freight will likewise shift from medium-sized trucks to pickups and large trucks. There is no assumed diversion of freight from the railroad since the SRC will certainly take whatever steps are necessary to maintain its level of activity, and most types of freight (especially where transit time is not critical) will always be more economically moved by rail than by road.

5. Generated Traffic

There will certainly be agricultural activity stimulated by the new road. These benefits are discussed below. However, since freight carrying trucks have always travelled west with greater loads than they can find to take back east, this pattern is expected to continue. The generated increase in the number of freight vehicles travelling west is assumed to be proportional to the decrease in market prices brought about by decreased vehicle operating costs and increased competition. Assuming a demand elasticity of 1.0 results in generated traffic of about 5 percent of the normal AADT.

The Norconsult feasibility study likewise cites experience demonstrating an immediate increase in AADT of 20 percent due to passenger traffic. Believing that this experience is generally more probable in areas where passenger vehicles are more readily available, the consultant prefers to use a number between 10 and 20 percent which includes generated bus, passenger car, and pickup traffic combined.

6. Traffic Projections and Vehicle Mixes

After the completion of the project road and the normal immediate (first year) increase in traffic, it is estimated that traffic will continue to increase by at least 5 percent per year, based upon road passenger increases, more freight from Khartoum in excess of rail capacities, general growth in regional population, etc. This increase is considerably lower than those assumed by both JICA and Norconsult. Part of this caution is due to a desire to estimate benefits conservatively. The rest is due to the uncertainties inherent in an economic situation which is not expected to improve much in the foreseeable future.

The vehicle mix, which is now 90-95 percent medium trucks, will change markedly. Change can be estimated based upon experience on other paved roads not too close to Khartoum, such as Wad Medani-Sennar, Gedaref-Kassala, and Sennar-Kosti. The December 1982 surveys of the Transport and Communication sector of the Ministry of Financial and Economic Planning were reasonably reliable sources for vehicle mixes. It should be noted that these mixes differ somewhat from the Norconsult and JICA estimates, which assumed that the mix would change much more rapidly once the road is paved. Norconsult assumed large trucks would be a much lower percentage of future traffic than shown below, while JICA assumed they would be somewhat higher.

Vehicle types referred to in the JICA and Norconsult feasibility studies are still applicable: a "standard" car is a Toyota Corolla, a pickup has a rated load of 1 1/2 tons or 10 passengers, a medium truck is a 6 ton Bedford, a bus is 6 tons gross weight or 45 passenger capacity, and a heavy truck is an 11 ton Fiat 682.

Based upon the assumptions and observations outlined above, the following traffic and vehicle mixes are projected for the project road:

PROJECTED VEHICLE MIX, KOSTI, UMM RUWABA

	<u>Medium trucks</u>	<u>Buses</u>	<u>Pass. cars, pickups</u>	<u>Large trucks</u>	<u>Total AADT</u>
Dec., 1982	--	--	--	--	253
1985	--	--	--	--	279
1988	287(80)	8(20)	55(15)	10(3)	360
1992	266(55)	40(9)	95(24)	37(12)	438
1997	240(43)	56(10)	162(29)	100(18)	558
2002	285(40)	71(10)	214(30)	143(20)	713
2007	364(40)	91(10)	273(30)	182(20)	910

PROJECTED VEHICLE MIX, UMM RUWABA-EL OBEID

	<u>Medium trucks</u>	<u>Buses</u>	<u>Pass. cars, pickups</u>	<u>Large trucks</u>	<u>Total AADT</u>
Dec., 1982	--	--	--	--	211
1985	--	--	--	--	225
1988	231(78%)	12(4%)	44(15%)	9(3%)	296
1992	190(53)	47(13)	83(23)	40(11)	360
1997	179(39)	69(15)	128(29)	83(18)	459
2002	205(35)	88(15)	176(30)	117(20)	586
2007	262(35)	112(15)	224(30)	150(20)	748

7. Vehicle Operating Cost Savings

Transport benefits accruing to a new road may come from savings in vehicle operating cost, savings in travel time, savings in the cost and time of diverted traffic, and the benefits of generated traffic.

The traditional method of evaluating road projects focuses on the savings in operating costs which accrue to the operators and owners whose vehicles use the improved road. This method considers present and future traffic levels (normal, generated, and diverted), and an assessment of the reduction in vehicle operating costs due to the improved road surface. The difference between the total annual road user costs for the two cases (before and after improvement) is the annual net benefit.

A reasonable amount of data is available on the operating costs and characteristics of the most commonly used 6-ton trucks (Bedford, Austin). The following updated economic operating cost was developed for this vehicle:

ECONOMIC TRUCK OPERATING COSTS ON SAND IN KORDOFAN (MID 1983)

	<u>Pounds Sudanese</u>
Vehicle: Bedford or Austin - 6 ton	
Cab and frame	38,000
Body and reinforcement	6,500
-minus tires (incl. below)	-2,200
Initial Value	42,300
Residual Value (50% after 6 yrs.)	21,150
Present value of resid. value (at 12%)	<u>-10,700</u>
Amount to be depreciated	31,600
Yearly costs	
Depreciation (at 12% over 6 years)	7,700
Insurance	100
Maintenance	3,300
Driver +2 assts.	4,000
Fuel	13,600
Oil and lubricants	1,400
Tires	3,800
Overhead	<u>4,100</u>
	Total 38,000
Yearly use	30,000 km.
VOC per km.	<u>1.27 LS</u>

This value compares well with Norconsult VOC (1977) separated into foreign exchange and local components, and escalated appropriately for subsequent inflation and changes in exchange rates.

Using the updated VOC (vehicle operating cost) for the 6 ton truck as a guide, the following table was extrapolated from the 1.27 figure from similar JICA and Norconsult tables indicating the VOC relationships among vehicles and road surfaces:

ECONOMIC VEHICLE OPERATING COSTS PER KILOMETER (KORDOFAN)
(MID 1983 LS)

	<u>passenger cars, pickups</u>	<u>medium trucks, buses</u>	<u>heavy trucks</u>
El Obeid-Umm Ruwaba			
sand	0.57	1.24 ^a	2.13
paved	0.23	0.47	0.47
savings	0.34	0.77	1.39
Umm Ruwaba-Tendelti			
sand	0.65	1.27	2.17
paved	0.23	0.47	0.74
savings	0.42	0.80	1.43
Tendelti-Kosti			
sand	0.74	1.30 ^a	2.21
paved	0.23	0.47	0.74
savings	0.51	0.83	1.47

It should be noted that VOC's are highest between Tendelti and Kosti, where the present route is in the worst condition.

8. Diverted Traffic

Various conventions are used for determining the benefits that should be allocated to diverted and generated traffic, since it can be argued that neither fits neatly into the category developed above. To avoid unnecessarily complicating of benefits, it is shown below that diverted and generated traffic are a small percentage of the total and that the conservative approach adopted for calculating benefits permits us to consider all such traffic as normal traffic for the inclusion of the related benefits.

As mentioned earlier, all of the traffic which now moves through the desert will probably divert to the new road if it is moving in the same general direction. It may be assumed that this diverted traffic accrues the full benefits given to normal traffic. Taking the desert route from El Obeid to Khartoum as an example, the route actually taken by most of the trucks is only 13 percent shorter than the new road, while the new operating cost is almost one third the old. The increased distance is therefore not a significant added cost.

Likewise the traffic due to passengers diverted from the railroad is a very small percentage (less than 5 percent) of the projected traffic on the road, and may therefore be given full benefit, rather than the usual 50 percent, without materially affecting the total benefits.

Finally, the pickup traffic diverted from medium truck traffic has a higher VOC per ton-km. than the medium truck, while large truck traffic diverted from medium trucks has a lower VOC per ton-km. Since the two balance each other the full VOC saving may be applied to all traffic.

9. Generated Traffic

Generated passenger and freight traffic amount to about 15 percent of AADT, and would customarily be allotted 50 percent of the normal benefits. Instead of wasting time with the calculation of this relatively small amount, we may assume generated traffic accrues the full benefits. These assumptions are more than compensated by the social benefits discussed below and by the benefits due to the reduced length of the new alignment, neither of which will be quantified. In addition, the conservative assumptions used in projecting traffic for the new road can only underestimate the real benefits.

10. Time Savings

The value of individuals' time savings in using the new road is difficult to calculate precisely. Presently about 200 persons per day leave El Obeid for Omdurman on buses, having paid an extra 10 LS above truck or train fare for the advantage of arriving a day ahead of either of the other modes of travel. 10 LS may be given as the perceived benefit of saving one day.

We may assume that bus passenger fares will decline and that this will attract new ridership with a lower time/value threshold than the present passenger profile. Passengers on trucks will also gain time savings but the lower level of service has less value. The bus is customarily the vehicle used by time sensitive passengers and is the only vehicle for which time savings is calculated.

11. Other Transport Benefits

In addition to the benefits outlined above, the improved road to El Obeid will provide easy access to the new El Obeid-Dubeibat road constructed by the Dutch. While many of the associated benefits will be agricultural, the Dutch road may be a source of significant immediate traffic on the road under consideration.

VOC Savings - Kosti-Um Ruaba

Year	KOSTI-EL OBEID							
	AADT medium trucks, buses ^a	Annual VOC Savings (LS x 10 ⁶)	AADT passenger cars pickups	Annual VOC savings (LS x 10 ⁶)	AADT large trucks	Annual VOC savings (LS x 10 ⁶)	Annual VOC savings (LS x 10 ⁶)	Total Annual VOC savings (LS x 10 ⁶)
1988	295	14.6	54	1.5	11	1.0	17.1	29.1
1989	291	14.4	68	1.9	19	1.7	18.0	31.0
1990	286	14.2	79	2.2	32	2.8	19.2	33.0
1991	284	14.1	92	2.6	42	3.7	20.4	35.2
1992	280	13.9	105	3.0	53	4.7	21.6	37.4
1993	280	13.9	115	3.3	64	5.6	22.8	39.7
1994	284	14.1	125	3.6	72	6.3	24.0	42.0
1995	289	14.3	137	3.9	81	7.1	25.3	44.4
1996	293	14.5	149	4.2	90	7.9	26.6	46.8
1997	296	14.6	162	4.6	100	8.8	28.0	49.5
1998	305	15.1	170	4.8	111	9.8	29.7	52.4
1999	312	15.4	185	5.3	123	10.8	31.5	55.5
2000	324	16.0	194	5.5	129	11.4	32.9	58.2
2001	340	16.8	204	5.8	136	12.0	34.6	61.1
2002	357	17.7	214	6.1	143	12.6	36.4	64.2
2003	374	18.5	224	6.4	150	13.2	38.1	67.3
2004	393	19.4	236	6.7	157	13.8	39.9	70.6
2005	413	20.4	248	7.1	165	14.5	42.0	74.2
2006	433	21.4	260	7.4	173	15.2	44.0	77.8
2007	455	22.5	273	7.8	182	16.0	46.3	81.9

^aAnnex 6

^b[(0.03 LS saved per km x 92 km. Kosti to Tend.)+(0.80 LS x 74 km. Tend. to U.R.)] 365 d./yr. x AADT = 49,479 x AADT

^c[(0.51 LS/km. x 92 km)+(0.42 LS/km. x 74 km.)] 365 d./yr. x AADT = 28,470 x AADT

^d[(1.47 LS x 92)+(1.43 LS x 74)] 365 x AADT = 87,987 x AADT

^eSum of columns 2,4,6

^fSum of column 7 on this page and column 7 on Um Ruaba-Ei Obeid page

VOC SAVINGS - UM RUABA-EL OBEID

Year	AA DT medium trucks, buses ^a	Annual VOC Savings (LS x 10 ⁶)	AA DT passenger cars pickups	Annual VOC savings (LS x 10 ⁶)	AA DT large trucks	Annual VOC savings (LS x 10 ⁶)	Annual VOC savings (LS x 10 ⁶)
1988	243	9.2	44	2.2	9	0.6	12.0
1989	239	9.1	56	2.8	16	1.1	13.0
1990	238	9.0	65	3.2	23	1.6	13.8
1991	237	9.0	75	3.7	31	2.1	14.8
1992	238	9.0	83	4.1	40	2.7	15.8
1993	238	9.0	91	4.5	49	3.4	16.9
1994	238	9.0	99	4.9	60	4.1	18.0
1995	242	9.2	108	5.3	67	4.6	19.1
1996	245	9.3	118	5.8	74	5.1	20.2
1997	248	9.4	129	6.4	83	5.7	21.5
1998	251	9.5	140	6.9	92	6.3	22.7
1999	253	9.6	152	7.5	101	6.9	24.0
2000	266	10.1	160	7.9	106	7.3	25.3
2001	279	10.6	167	8.2	112	7.7	26.5
2002	293	11.1	176	8.7	117	8.0	27.8
2003	308	11.7	185	9.1	123	8.4	29.2
2004	323	12.3	194	9.6	129	8.8	30.7
2005	339	12.9	203	10.0	136	9.3	32.2
2006	356	13.5	214	10.6	142	9.7	33.8
2007	374	14.2	224	11.1	150	10.3	35.6

^aAnnex 6

^b(0.77 LS saved/km)(135 km. U.R. to E.O)(365 d./yr.) x AADT = 37,942 x AADT

^c(0.34)(135)(365) x AADT = 49,399 x AADT

^d(1.39)(135)(365) x AADT = 68,492 x AADT

^eSum of columns 2,4,6 - This is also total VOC savings for Alternative 3.

BUS PASSENGER TIME SAVINGS

RECAP-TOTAL VOC AND PASSENGER TIME SAVINGS

	Kosti-El Obeid	Kosti-El Obeid
	Total Value of Time Savings ¹ (LS x 10 ⁶)	LS x 10 ⁶
1988	0.3	29.4
1989	0.7	31.7
1990	1.0	34.0
1991	1.3	36.5
1992	1.6	39.0
1993	1.8	41.5
1994	2.0	44.0
1995	2.0	46.4
1996	2.2	49.0
1997	2.3	51.8
1998	2.4	54.8
1999	2.5	58.0
2000	2.7	60.9
2001	2.7	63.8
2002	2.9	67.1
2003	3.1	70.4
2004	3.2	73.8
2005	3.4	77.6
2006	3.6	81.4
2007	3.8	85.7

¹ AADT x 365 d/yr x 40 pass. ave/bus x 6 hrs saved per pass. -24 hrs/d x 5 LS/d
value of time saved = AADT x 18,250 LS.

Detailed Cost Analysis

I. Introduction

Detailed costs are based on the cost figures developed by NORCONSULT for the final design of the Kosti-Umm Ruwaba section of the road and by Dar-Al-Handasah for the Umm Ruwaba-El Obeid section, both of which were checked and updated in the Berger study. Therefore, the base costs used for the cost analysis are from the Berger study, escalated for inflation from mid-1983 to the mid-construction point. An inflation rate of 7 1/2% per annum is used for the foreign exchange portion and 25% per annum for the local currency part. All costs include a 10% contingency factor. The Berger study's unit prices are supported and verified by an analysis that appears reasonable and accurate. In the construction cost analysis the foreign exchange component of total costs is 83%, the local currency cost 17%. All costs are expressed in dollars at an exchange rate of \$1.00 to LS 1.3. The exchange rate used for the economic analysis, by contrast, is the shadow rate of LS 2.2 per \$1.00.

As explained in Section III, ADB funds are fixed at \$38.5 million. As a result of the decision to have ADB and AID finance separate section of the road and not mix funds for the Kosti-Umm Ruwaba section, the ADB-financed section had to be shortened. The decision to replace the cement stabilized subbase and base materials with crushed stone resulted in higher costs per kilometer on the Kosti-Umm Ruwaba section, also reducing the total kilometers to be financed by the ADB. The cost of AID's section of the road was developed by first determining the cost per kilometer for the revised design of the Kosti-Umm Ruwaba section to determine how many kilometers the ADB funds would finance. The balance of the total road distance was then to be financed by AID.

In summary, the cost per kilometer of the Kosti-Umm Ruwaba section was determined and then divided into the total amount of funds available from the ADB. This resulted in the ADB nominally financing a shorter distance. AID funds needed for construction were then determined by multiplying the average cost per kilometer times the balance of 185 kilometers. The engineering services for the ADB-financed section will be financed by NORAD; \$ 2.770 million are available for this purpose. This amount appears adequate. The cost of the engineering services for the AID-financed road section was developed in addition to the maintenance component for the entire road. These two elements were then added to the AID-financed construction cost to determine the total AID contribution.

II. Cost Estimate - Section 1 - ADB-Financed

A. Design

The methodology used to determine the cost per km was to remove those costs attributable to the construction method using a cement treated base and replace them with the costs resulting from the use of crushed stone.

1. Pavement - Original Design (NORCONSULT/Berger Reports)

	_____ 116 km _____	_____ 50 km _____
Base Course	min. 10 cm crushed stone	15 cm. stabilized gravel
Sub-Base	min. 15 cm stabilized sand	10 cm. stabilized sand

2. Pavement - Revised Design

166 km

Base Course	min. 15 cm. crushed stone
Sub-Base	10 cm. select natural materials or crushed stone
Kosti	Tendelti
	Umm Ruwaba

B. Development of Cost per Kilometer

1. Materials and Quantities to be deleted

Stabilized sand 10.25 m. width x 0.15m. thickness x 116 km. length	178,350 m ³
Stabilized sand 10.25 m. width x 0.10 m. thickness x 50 km. length	51,250 m ³
Total stabilized sand	229,600 m ³
Stabilized gravel 10.25 x .15 x 50	76,875 m ³

2. Cost of materials to be deleted (From Berger Report For January 1981)

(a) Stabilized Sand

Dune aggregate	LS 4.7/m ³
3% cement @ LS 165/T	LS 12.8/m ³
Mix and cure (Estimated)	LS 10.0/m ³
Total	LS 27.5/m ³

(b) Stabilized Gravel

Natural aggregate	LS 7.0/m ³
3% cement @ SL 165/T	LS 12.8/m ³
Mix and cure	LS 10.0/m ³
	LS 29.8/m ³

Overhaul at LS 0.50/m³/km beyond 2 km.
(By road) (Rawani gravel pit 25 km east of Kosti)

(c) Crushed stone

Aggregate at quarry LS 28.5/m³

Overhaul at LS 0.50/m³ beyond 35 km.
(By road) (Jebel Kon quarry 36 km NE of Tendelti)
(Jebel Kodi quarry 56 km E of Kosti)

3. Total Cost of deleted materials

Stabilized sand (229,600 m³ x LS 27.5/m³) = LS 6.31 million

Stabilized gravel (76,875 m³) x
(LS 29.8 + LS 24 for average overhaul) = LS 4.14 million

Total LS10.45 million
=====

4. Materials and quantities to be added

Crushed stone 10.25m x 0.15m x 116 km = 178,350 m³ (1,537.5 m³/km)

Crushed stone 10.25m x 0.25m x 50 km = 128,125 m³ (2,562.5 m³/km)

Total Material Added 306,475 m³
=====

5. Net cost of materials to be added

Crushed stone 73.7 km x 1,537.5 m³/km
x (LS 29.5 + LS 18.9 for average overhaul) LS 5.48 million

Crushed stone 42.3 km x 1,537.5 m³/km
x (LS 29.5 + LS 11.1 for average overhaul) LS 2.64 million

Crushed stone 50 km x 2,562.5 m³/km
x (LS 29.5 + LS 23 for average overhaul) LS 6.73 million

Total cost of additions LS14.85 million

Total cost of deletions (from 5 above) LS10.45 million

Net cost of increase (January 1981 prices) LS 4.40 million

FX equivalent (LS 1.3 = \$ 1.00) \$ 3.38 million

6. Cost per/km of Net Addition

Net cost of additon \$ 3.38 million

Plus 10% Contingency \$ 0.34 million

Total FX Equivalent \$ 3.72 million
=====

83% FX = \$3.08 million

17% LS = \$.64 million

Escalated to October 1987

FX = \$ 5.02 million

LS = \$ 2.91 million

Average increase per kilometer = FX $\frac{5.02}{166}$ = \$ 30,241/km

Average increase per kilometer = LS $\frac{2.91}{166}$ = \$ 17,530/km

7. Total Kilometers to be financed by ADB funds (\$38,488,000)

	<u>FX in \$</u>	<u>LS in \$</u>
- Average cost per/km - original design*	299,819	112,234
- Average Cost per/km - addition-revised design	30,241	17,530
- Total average cost per/km revised design	<u>\$ 330,060</u>	<u>LS \$ 129,764</u>

ADB section \$ 38,488,000 = 116.6 kilometers
\$330,060 per km Use - 116 km

ADB section Cost Summary (116 kilometers)

- Construction	FX \$ 38,500,000	LS \$ 15,100,000
- Engineering	FX \$ 2,770,000	LS \$ 900,000
- Total	<u>FX \$ 41,270,000</u>	<u>LS \$ 16,000,000</u>

* Based on total costs presented on the last page of this annex. Use mid-1987 construction cost estimate.

III. Section 2 - Construction Services, AID-Financed

A. Distance

Tendelti area to Umm Ruwaba	=	50 km
Umm Ruwaba to El Obeid	=	135 km
 Total		<u>185 km</u> =====

B. Cost per kilometer

1) Umm Ruwaba - El Obeid Section

a) Total Cost (See mid-1988, last page of this annex)

FX = \$ 34,400,000

LS = \$ 19,470,000 or LS \$ 14,977,000

b) Cost per kilometer

FX \$ $\frac{34,400,000}{135 \text{ km}}$ = FX \$ 254,815/km

LS \$ $\frac{14,977,000}{135 \text{ km}}$ = LS \$ 110,940/km

2. Tendelti Area - Umm Ruwaba section

FX \$ 330,060/km (see section II above)

LS \$ 129,764/km (see section II above)

C. Total estimated cost (\$000)

1. FX 135 km x \$254,815	=	FX \$ 34,400
50 km x \$330,060	=	FX \$ 16,503

Total FX = FX \$ 50,903
=====

Use = FX \$ 51,000

2. LS 135 km x LS \$ 110,940/km	=	LS \$ 14,977
50 km x LS \$ 129,764/km	=	LS \$ 6,598

Total LS in \$ LS \$ 21,465
=====

Use LS \$ 21,500

D. Road connections to market centers

1) Umm Ruwaba = 2.0 km

FX = \$254,815 x 2 = \$509,630

LS = \$110,940 x 2 = \$221,880

2) El Rahad = 1.5 km

FX = \$254,815 x 1.5 = \$382,223

LS = \$110,940 x 1.5 = \$166,410

Subtotal

FX \$891,853

LS \$388,290

E. Maintenance/Workshops and Shop Equipment

	<u>FY in \$000</u>	<u>LS in \$000</u>	<u>Total</u>
Umm Ruwaba	500	200	700
El Obeid	200	100	300
El Rahad	300	100	400
	<u>FX \$ 1,000</u>	<u>LS \$ 400</u>	<u>\$ 1,400</u>
	=====	====	=====

F. Stockpiling road maintenance Materials

(Umm Ruwaba, El Rahad, El Obeid) (in \$000)	FX \$ 500	LS \$ 200	\$ 700
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G. Summary of Construction Contract Costs

	<u>FY in \$000</u>	<u>LS in \$000</u>	<u>Total</u>
1. Construction 185 km. plus 3.5 km. connections	51,900	21,900	73,800
2. Maintenance shops	1,000	400	1,400
3. Stockpiling materials	500	200	700
	<u> </u>	<u> </u>	<u> </u>
Total Funding	FX \$ 53,000	LS\$ 22,500	\$ 75,800
	=====	=====	=====

IV. Engineering Services-Section 2 - AID-Financed

A. Engineering Services Required

- Preparation of final design and tender documents
- Updating of construction cost estimate
- Construction supervision and inspection
- Study for Maintenance Program

B. Final Design/Cost Estimates/IFB Documents

Scope of Work: Site visit, plans-in-hand route inspection of proposed roadway, worksheets plan and profile for cross-section change, recompute quantities, preparation of designs for maintenance centers, revision of embankment height, revision and modification of tender documents to conform to U.S. standards, updating cost estimate. Reproduction of 50 sets of IFB documents, half-size plans and profile scheduled for 185 kilometers of road.

	<u>FX in \$000</u>	<u>LS in \$000</u>
1) 6 person months in field X \$6000/mo.	36	30
2) 18 person months in U.S. X 4,500/mo.	81	0
3) Home Office overhead @ 125%	146	0
4) Travel (2 people Khartoum X 2 round trips)	28	10
5) Reproduction IFB documents	25	0
6) Fee (10% of Direct Cost of Labor)	12	0
7) Contingency (15%)	50	6
	<hr/>	<hr/>
March-August, 1985	378.0	46
	<hr/>	<hr/>
Use	FX \$ 380.0	LS \$ 45
	<hr/>	<hr/>

C. Technical Assistance

1. Long-Term

a) Resident engineer	March 1, 1985 to July 31, 1990	= 65 months
b) Construction engineer	June 1, 1986 to June 1, 1990	= 48 months
c) Testing engineer	June 1, 1986 to June 1, 1990	= 48 months
		<hr/>
		= 161 months
		<hr/>

2. Short-Term

a) Bridge engineer		6 months
b) Hydraulic engineer		4 months
c) Others		<u>10 months</u>
		<hr/>
Total		20 months
		<hr/>

D. Cost Analysis of Engineering Services

1) Resident engineer - 65 months

(family status, 2 children)

March 1, 1985 - July 31, 1990

a) Salary (uninflated)	\$4200 month
b) Post differential (25%)	\$1050 month
c) Fringe (22%)	<u>\$1000 month</u>
	\$6250 month
d) Field overhead, 85%	<u>\$5300 month</u>
	<u>\$11550 month</u>
	=====

Escalation of overhead and incremental salary increases (10% per annum)

		<u>FX</u>	<u>LS (15%)</u>
1985	10 months x 11,550	115,500	17,325
1986	12 months x 12,705	152,460	22,869
1987	12 months x 13,975.5	167,706	25,154
1988	12 months x 15,373	184,476	27,670
1989	12 months x 16,910	202,923	30,436
1990	<u>7 months x 18,601</u>	<u>130,207</u>	<u>19,530</u>
	65	FX\$ 953,272	LS\$ 142,984
	==	=====	=====

Allowances

- Education (5 years @ 20,000)	\$ 100,000
- COLA (\$150 month x 55 months)	\$ 9,750
- Misc. items (\$1000 yr. x 5 yrs.)	<u>\$ 5,000</u>
- Subtotal	<u>\$ 114,750</u>

Travel and Transportation

- International travel and per diem	-	15,000
- Round trips @ \$3400 each		
4 people x 5 trips x 3400	68,000	10,000
- HH. goods (2 times)	40,000	10,000
- Storage, unaccompanied baggage, consumables	80,000	12,000
- Subtotal	<u>\$ 188,000</u>	<u>LS\$ 43,000</u>
- Fee - (10% of Direct Labor Salary, post differential, Fringe, escalations	52,000	7,800
- Totals	<u>FX \$ 1,308,022</u>	<u>LS \$ 193,784</u>
- Use	<u>FX \$ 1,310,000</u>	<u>LS \$ 200,000</u>

2) Construction Engineer and Testing Engineer

(family status, 2 children)

May 1, 1986 to May 1, 1990 = 48 months

a) Salary (base, uninflated)	\$ 4000 month
b) Post differential (25%)	\$ 1000 month
c) Fringe (22%)	\$ 880 month
d) Field Overhead, 85%	\$ <u>5000 month</u>
	\$10,880 month
	=====

Escalation of overhead and Incremental

increase of Salary @ 10% year

	<u>FX</u>	<u>LS</u>
1985 = 0 x 10,880	0	0
1986 = 8 months x 11,968	59,744	8,362
1987 = 12 m x 13,165	157,977	23,696
1988 = 12 m x 14,482	173,778	26,067
1989 = 12 m x 15,930	191,160	28,674
1990 = <u>4 m</u> x 17,523	70,092	10,514
48 m	<u>\$ 688,751</u>	<u>LS\$ 103,313</u>
==	=====	=====

Allowances

- Education 4 years x 20,000	80,000	-
- COLA \$150 m x 45	7,200	-
- Misc. items \$1000 x 4 yrs.	4,000	-
- Subtotal	<u>\$ 91,200</u>	<u>-</u>
	=====	=====

Travel and Transportation

- Internal Travel and Per Diem	-	5,000
- Airline, round trip @ 3400 each 4 people x 4 trips x \$3400	54,000	5,000
- HH goods (2 times)	40,000	10,000
- Consumables, storage, unaccompanied baggage	60,000	10,000
Subtotal	<u>\$ 154,400</u>	<u>LS\$ 30,000</u>
	=====	=====
	\$ 934,351	LS\$ 133,313

<u>Fees</u> (@ 10% salary, Post Diff., fringe, escalation)	37,234	5,582
---	--------	-------

<u>Total</u> (for 1 Construction Engineer or 1 Testing Engineer)	971,585	138,895
---	---------	---------

Rounded Total (for both T.A. positions)	1,960,000	280,000
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3) Short term technical assistance

20 mm throughout 4 years (Home Office Overhead and Post Differential)

	<u>FX in \$</u>	<u>LS in \$</u>
a. Salary 20 mm x \$14,000/month	280,000	47,000
b. Allowances	8,000	10,000
c. Travel	30,000	-
d. Fee @ 10% Direct Labor	13,000	2,100
 Total	 <u>FX \$ 331,000</u> <u>=====</u>	 <u>LS \$ 59,100</u> <u>=====</u>
 Use	 FX \$ 330,000	 LS \$ 60,000

4) Home Office Support

Home office project managers (Home Office Overhead, no differential)

a. Salary: 21 months x \$12,000/month	252,000	-
b. Miscellaneous	6,000	-
c. Fee @ 10% Direct Labor	11,000	-
 Total	 <u>FX \$ 269,000</u> <u>=====</u>	 <u>NIL</u> <u>=====</u>
 Use	 FX 270,000	 LS 0

5) Preparation of maintenance study

September - October, 1988 (Home Office Overhead, Post Differential)

a) Salary: 2 months x 3 people x \$15,000/month (visit to site)	90,000	6,000
b) Allowances	5,000	-
c) Travel and Per Diems	30,000	12,000
d) Fee @ 10%	5,000	1,000
 Total	 <u>130,000</u> <u>=====</u>	 <u>19,000</u> <u>=====</u>
 Use	 FX \$ 130,000	 LS \$ 20,000

6) Totals for Engineering Services

	<u>FX in \$</u>	<u>LS in \$</u>
a) Design IFB Preparation	380,000	45,000
b) Construction supervison	3,870,000	540,000
c) Maintenance study	130,000	20,000
d) Contingency (15%) (items a-c)	660,000	790,000
Total	<u>FX \$ 5,040,000</u>	<u>LS \$ 695,000</u>

V. Maintenance Component of the Project (Funded but not obligated until after the Maintenance Study)

A. Engineering Services

1. Procurement of maintenance equipment, tools, spares etc.
2. Technical assistance to maintenance operations.

B. Illustrative List of Equipment (for 300 km section, Kostl to El Obeid)

Requirements - To be firmed during maintenance study.

	<u>FX in \$000</u>	<u>LS</u>
1. 1-grader, 125 H.P.	120	
2. 1-front end loader, 90 H.P.	80	
3. 2-Dump trucks, 7 ton	140	
4. 1-pick up, 3/4 ton	25	
5. 2-Asphalt kettles/mixers/sprayers	50	
6. 1-self propelled compactor, steel wheel	50	
7. Spare-parts - lot	50	
8. Tools/hand tools - lot	50	
9. 2-Portable weight scales	10	
10. Fuels 2 years operation	50	
11. 2 vibration plate compactor	10	
12. Bitumen spray tank truck	25	NIL
Totals	<u>FX \$ 660</u>	<u>LS 0</u>

C. Contract maintenance/support to RBPC for 12 month period

1. shoulder, ditch cleaning
2. surface patching
3. structure repair/marker repair

FX \$ 0 LS \$ 250

D. Technical Assistance

	<u>FX in \$000</u>	<u>LS</u>
a. Salaries: (Field Overheads, Post Differential)		
1. maintenance engineer, 12 months @ \$10,000	120	20
2. master mechanic, 12 months @ \$10,000	120	20
b. Allowance: 24 mo @ \$500	12	
c. Travel, consumables, unaccompanied baggage	52	
d. Fee @ 10% of direct labor	13	
Subtotal	<u>337</u>	<u>40</u>
Use	<u>FX \$ 340</u>	<u>LS \$ 40</u>

VI. Totals for Maintenance Component

A. To be furnished under the construction contract

FX in \$000 LS in
\$ 000

1. Maintenance Centers 1,000 400
2. Stockpile Materials 500 200

B. To be furnished under the engineering services

1. Study for maintenance program 130 20
2. Technical Assistance 340 40
3. Contract maintenance - 250
4. Equipment/Spares 660 -

Totals FX \$ 2,630 LS\$ 910

VII. Summary of Costs - AID-Financed

A. Project Costs

	<u>FX in \$000</u>	<u>LS in \$000</u>	<u>Total</u>
1. Construction Services			
- Constuction of Section 2	50,930	21,500	72,430
- Connecting roads	900	400	1,300
- Maintenance workshor	1,000	400	1,400
- stockpile material	500	200	700
	<hr/>	<hr/>	<hr/>
- Subtotal	\$ 53,330	LS \$ 22,500	\$ 75,830
2. Engineering Services			
- Design and IFB preparation	380	045	425
- Resident Engineer	1,310	200	1,510
- Construction, Testing Engineer	1,960	280	2,240
- Short term technical assistance	330	060	390
- Home office support	270	-	270
- Maintenance study	130	020	150
- Contingency	660	090	750
	<hr/>	<hr/>	<hr/>
- Subtotal	\$ 5,040	LS \$ 695	5,735
3. Maintenance			
- Equipment	660		660
- Technical assistance	340	040	380
- Contract maintenance	-	250	250
	<hr/>	<hr/>	<hr/>
- Subtotal	\$ 1,000	LS \$ 290	1,290
4. Other local cost		1,540	1,540
	<hr/>	<hr/>	<hr/>
Total	FX \$ 59,370	LS \$ 25,025	\$ 84,395
Use	FX \$ 60,000	LS \$ 25,000	\$ 85,000

B. Disbursement Schedule

	<u>\$Millions</u>						
	<u>FY-85</u>	<u>FY-86</u>	<u>FY-87</u>	<u>FY-88</u>	<u>FY-89</u>	<u>FY-90</u>	<u>Totals</u>
FX	1.0	10.0	14.5	18.0	12.0	4.5	60.0
LS	<u>.1</u>	<u>3.5</u>	<u>6.4</u>	<u>8.0</u>	<u>6.0</u>	<u>1.0</u>	<u>25.0</u>

Construction Cost Estimate (in Millions)

Basis: Berger Report November 1983,
 10% contingency
 7 1/2% Escalation in foreign exchange
 25% Escalation in local currency

Kosti-Umm Ruwaba Road

	<u>OCT '83</u>		<u>MID '86^{1/}</u>		<u>MID '87^{1/}</u>		<u>MID '88^{1/}</u>	
	<u>\$</u>	<u>LS</u>	<u>\$</u>	<u>LS</u>	<u>\$</u>	<u>LS</u>	<u>\$</u>	<u>LS</u>
<u>Construction:</u>								
Base	33.88	9.02	33.88	9.02	33.88	9.02	33.88	9.02
Contingency	3.39	0.90	3.39	0.90	3.39	0.90	3.39	0.90
Escalation	N.A.	N.A.	9.03	9.46	12.50	14.30	16.24	20.35
Subtotal	37.27	9.92	46.30	19.38	49.77	24.22	53.51	30.27
=====								
<u>Supervision</u>								
Base	2.03	0.54	2.03	0.54	2.03	0.54	2.03	0.54
Contingency	0.20	0.50	0.20	0.50	0.20	0.50	0.20	0.50
Escalation	N.A.	N.A.	0.54	0.56	0.75	0.85	0.97	1.21
Subtotal	2.23	0.59	2.77	1.15	2.98	1.44	3.20	1.80
=====								

Umm Ruwaba - El Obeid Road

	<u>OCT '83</u>		<u>MID '86^{1/}</u>		<u>MID '87^{1/}</u>		<u>MID '88^{1/}</u>	
	<u>\$</u>	<u>LS</u>	<u>\$</u>	<u>LS</u>	<u>\$</u>	<u>LS</u>	<u>\$</u>	<u>LS</u>
<u>Construction:</u>								
Base	21.78	5.80	21.78	5.80	21.78	5.80	21.78	5.80
Contingency	2.18	0.58	2.18	0.58	2.18	0.58	2.18	0.58
Escalation	N.A.	N.A.	5.81	6.08	8.40	9.20	10.44	13.09
Subtotal	23.96	6.38	29.77	12.46	32.00	15.58	34.40	19.47
=====								
<u>Supervision:</u>								
Base	1.30	0.35	1.30	0.35	1.30	0.35	1.30	0.35
Contingency	0.13	0.03	0.13	0.03	0.13	0.03	0.13	0.03
Escalation	N.A.	N.A.	0.35	0.36	0.48	0.55	0.62	0.78
Subtotal	1.43	0.38	1.78	0.74	1.91	0.93	2.05	1.16
=====								

Social Soundness Analysis1. BeneficiariesA. The Project Road Areas of Influence

Estimation of the number of beneficiaries of the project should begin with a determination of the "area of influence" of the road for each crop to be transported over it.

The areas or zones of influence of the road are determined by: (1) the rural road network around the project road; (2) the distances from farmgate to project road and the perishability of the product to be transported; (3) the terrain; (4) the means of transport used; and (5) the attractiveness of alternative routes or modes of transport.

Once the areas of influence for various agricultural products have been determined, reference to census data for urban, rural, and nomadic groups living in the areas of influence will give an idea of the number of potential beneficiaries. Table E 1 presents such a compilation and Map EM-1 is a geographic presentation of the areas of influence, designed to serve as a reference companion to the Table.

B. Gum Arabic Producers: Potential Beneficiaries of the Project Road

One perspective on this issue is set out as follows:

In the case of gum arabic, there is no apparent mechanism by which the project road would significantly benefit production, since the transport of gum arabic is almost entirely handled by the railroad. It is assumed that the railroad places such importance on this particular long-distance commodity transport for which it has a clear competitive advantage over trucks that it will continue to dominate the gum arabic transport market throughout the project period.*

An alternative view of the attractiveness to gum producers of the project road appeared in a USAID interview with GOS officials (5 March 1984. El Obeid) who pointed out that delays in shipment by rail are a cause of loss of moisture in gum arabic, which means a deterioration in the quality of the product.**

* Louis Berger International, Inc. Economic Reappraisal of the Kosti-El Obeid Road For USAID. November, 1983.

** For presentation of the relation between gum arabic producing areas, the existing railway, and the proposed road, see Map EM-2, p. 4.

Table E-1

Western Agricultural Marketing Road

Urban Population, North and South Kordofan = Population of Towns 10,000

Benefits: Higher
Producer Prices
For:

Area of Influence

Potential Beneficiary
Population

Cities

El Obeid	=	140,024
El Nuhud	=	29,787
El Rahad	=	16,341
Umm Ruwaba	=	26,095
Bara	=	10,394
Kadugli	=	43,542
Babanusa	=	18,870
El Mujlad	=	12,732
TOTAL	=	297,785

Cash Crops

All Agricultural
Kordofan*

2,105,509

1. Gum Arabic

2. Sesame

Rural Council: El Obeid
Umm Ruwaba, Bara,
El Nuhud**

410,000

3. Groundnuts

All Agricultural Kordofan

2,105,509

4. Cotton

12,000 square miles
South of Semeih***

Mechanized: 6500 Farmers****
Traditional: 5300 Farmers
Total :11,800 Farmers

Rural Council

El Obeid	=	239,458
Umm Ruwaba	=	85,309
Bara	=	20,360
El Nuhud	=	68,952

5. Horticultural
Crops

Bara 10,394
El Obeid 140,024
El Rahad 16,341
Abbasiya
Rashad
+Areas within 30 km of the Road

6. Livestock

All Kordofan
(Most Southern Darfur
Livestock are shipped via rail)

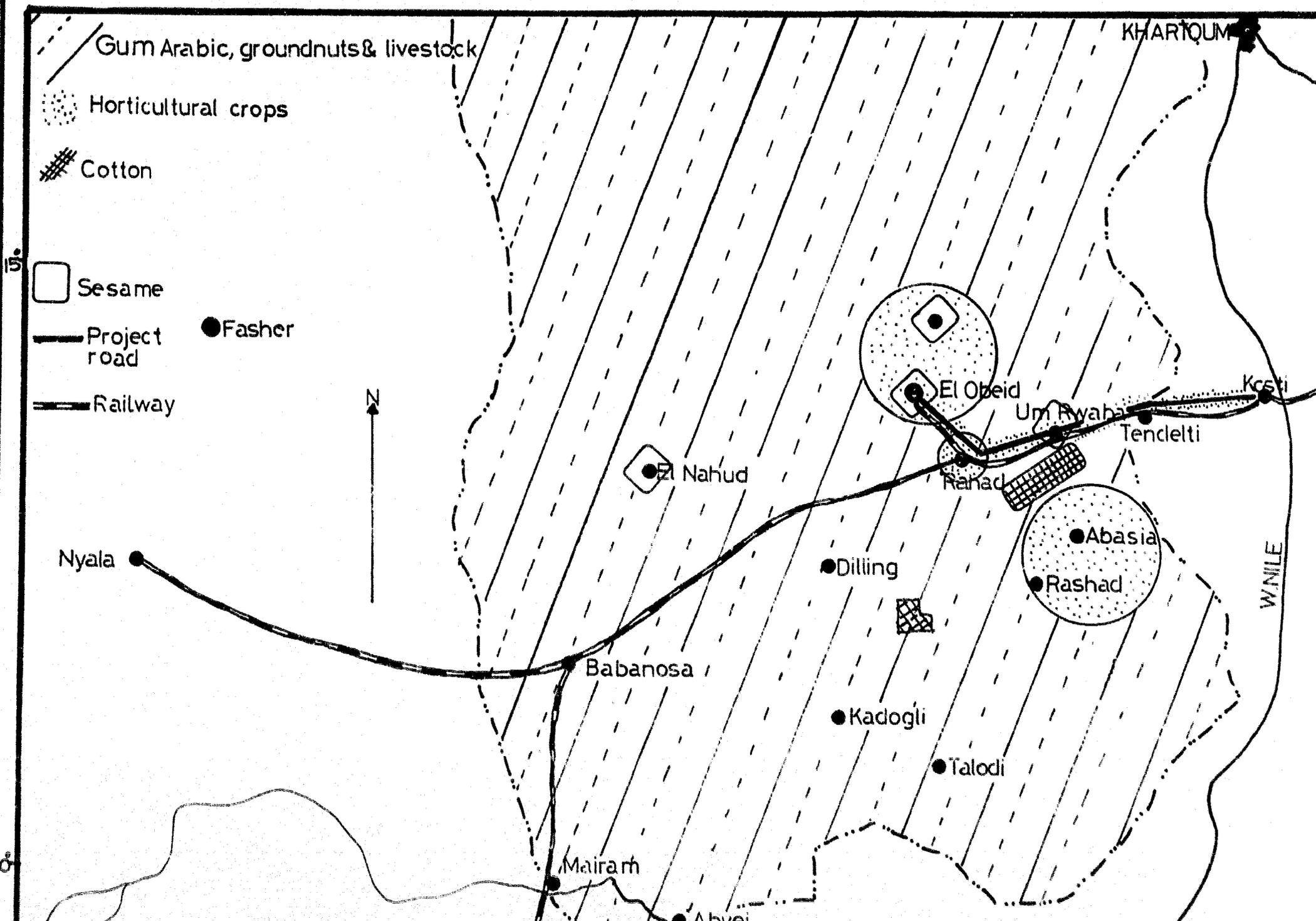
781,000

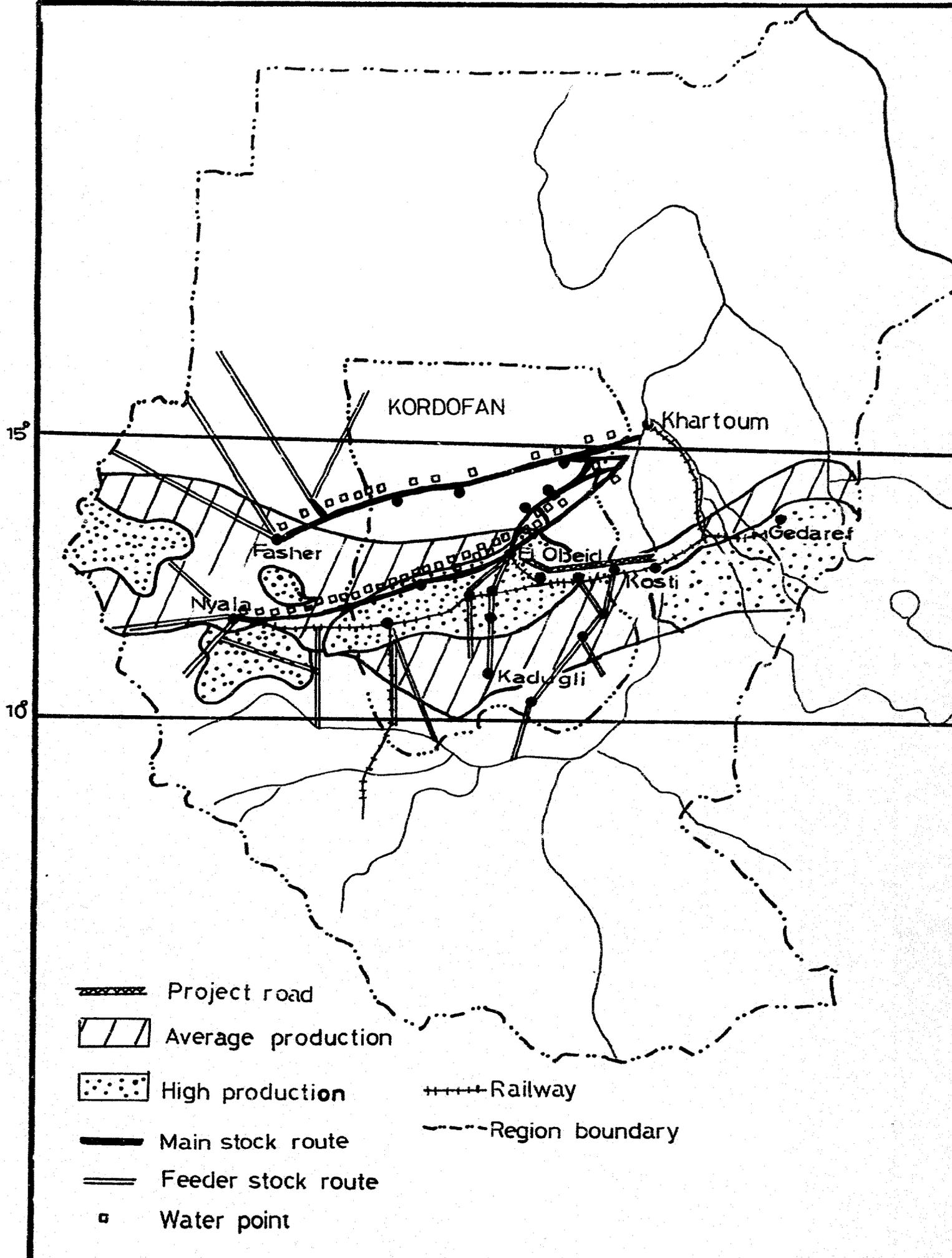
*	Agricultural Kordofan	=	Total Population/K	-	Nomadic Population	-	Urban Population
	Agricultural Kordofan	=	3,184,294	-	781,000	-	297,785
		=	2,105,509				

** 85% of Sesame Production is in North Kordofan, concentrated in Umm Ruwaba Area Council. Louis Berger International. Kordofan Region Agricultural Marketing and Transport Study. For USAID. March 1983.

*** 80% of Nuba Mountain Agricultural Corp. production transported through town of Semeih.

PROJECT ROAD AREAS OF INFLUENCE BY CROP





In a related interview (10 March 1984) agents at Umm Ruwaba for one of the large El Obeid gum merchants, asserted that the indirect costs of railroad use are high. They note that the turn-around time for a 25-to-40-ton box car, Umm Ruwaba-Port Sudan-Umm Ruwaba, averages 20 days at the height of the shipping season, while that of a 12-ton truck is about 4 days, freeing up capital for re-investment.

In the past, the Gum Arabic Company, created in 1969 as a 37-percent-Government-owned corporation with a monopoly on the export of gum arabic from the Sudan, would buy only gum shipped via the Sudan Railways Corporation, since it would accept only SRC manifests.

Now, gum merchants note that the Gum Arabic Company will also accept the manifests of the Shikan Company, a joint venture of the Northern Kordofan Regional Government and private shareholders. Shikan, based at El Obeid, runs 12-ton Renault trucks and is an efficient, time-saving complement to rail transport, the attractiveness of which would be enhanced with the completion of the project road.*

3. Population Centers

The main centers of population and agricultural marketing in the immediate vicinity of the road are: El Obeid, El Rahad, Semeih, Umm Ruwaba, Tendelti and Kostî.

El Obeid**, the terminus of the project road, is the capital of the Kordofan Region, as well as being the administrative center for, and largest city in, Western Sudan, with a population of 140,000 according to the 1983 Census.

El Obeid is internationally known as a center for the marketing of gum arabic. The export of this crop, which provided 10% of the country's foreign exchange in 1981, is vital to the economy of the Sudan. Eighty percent of the world's supply of gum arabic is produced in the Sudan, with the Kordofan Region contributing 52% of the country's production in 1981.

The city is located in the midst of a farming area in which the cropping pattern consists of a mixture of subsistence

* See Map, EM-1, p. 3.

** Description of El Obeid based on information contained in Louis Berger International Inc. Economic Reappraisal of the Western Agricultural Marketing Road. Prepared for USAID/Sudan, November, 1983, and Louis Berger International, Inc. Sudan: Kordofan Agricultural Marketing and Transport Study. Prepared for USAID Sudan, March 1983.

crops - sorghum, millet, watermelon and some cow peas - grown in conjunction with cash crops (sesame, groundnuts, roselle (i.e., kerkadeh) and watermelon. Animal husbandry in this system involves the rearing of livestock such as cattle, sheep, goats, camels, donkeys, horses and poultry. The city of El Obeid serves as a marketing center for these cash crops, and animals offered for sale.

Groundnuts and kerkadeh are exported to a large degree due to high international prices.

There are very few industrial establishments in El Obeid, indeed in the entire project area and most of these serve only the local population. These include oilseed shelling and processing mills, local textile mills, and fruit and vegetable drying and canning plants.

El Rahad*. A population of approximately 72,000 inhabit this major city of North Kordofan and the immediate surrounding area. Rahad, like Umm Ruwaba to the east, is also a major center for peanuts and peanut oil as well as sesame seeds and sesame oil. According to officials in this city and from personal observation, El Rahad has five peanut cleaning factories, all of which are privately owned. Each factory employs approximately 20 people on a seasonal basis, some four months out of the year. One other factory in Rahad works throughout the year producing peanut oil, sesame oil and cake, employing approximately 40 people.

Semeih. This is a tiny village, situated about 600 km southwest of Khartoum. Its most distinguishing feature is the presence of two huge warehouses, each approximately one city block long by a half a city block wide. This is the headquarters for Nuba Mountain Agricultural Corporation services to farmers of the region. The farmers of this area, which stretches south from Semeih covering an estimated 12,000 square miles, are in turn obligated to plant a specified amount of their land in cotton and sell this cotton to the Corporation at a fixed price. According to Corporation officials in Semeih, close to 80 percent of the cotton grown in the area is marketed through this town.

The cotton is collected by pickup, lorries and camels at nine different locations in the Nuba Mountains area and

* Descriptions of El Rahad, Semeih, and Umm Ruwaba are based on those found in the Preliminary Evaluation of USAID Project to Rehabilitate Certain Sudan Railways Corporation Infrastructure. USAID/Sudan. January, 1984.

Umm Ruwaba. Some 50,000 people reside in the town and the immediate surrounding area. This town, as well as the other villages just to the west, are centers for the marketing of peanuts, sesame, peanut oil and peanut cake. Anywhere from 10 to 15 peanut processing "factories" are currently functioning in Umm Ruwaba, engaged in deshelling and bagging peanuts. All of the factories are privately owned by local entrepreneurs.

Tendelti population 15,509*, is principally a "truck stop", "rail stop" and small market town on the east-west route between Kosti and Umm Ruwaba. It is a place for truckers to eat, sleep, and refuel their vehicles.

Kosti is the eastern terminus of the project road. It has been said that this city of 92,000* is to the Sudan of the twenty first century as Chicago was to the America of the nineteenth. Push-and-pull factors are causing Kosti to grow "on its own". Investment and population are pulled toward the city because of its location as a nexus of river, rail, and road transport routes. It is:

- (1) a point of transshipment for cargo moving by river to and from Juba;
- (2) the furthest point west on the existing paved roads to Khartoum and Port Sudan and the location of the only bridge on the Nile in the 1435 km between Khartoum and Juba; and
- (3) the major handler of rail transport to and from the west and southwest.

* GOS Census Section, Department of Statistics, Ministry of Planning. 1983 National Census.

Kosti is also growing because of its proximity to productive agricultural areas of the Gezira and Southern Kordofan.

At the same time many Sudanese are pushed toward Kosti from the drought-affected areas of Kordofan.

4. Other Beneficiaries

Aside from farming, the proposed road will benefit the trucking industry and consumers. Currently, lorry drivers on farm-to-market roads must replace differentials and gear boxes twice a year because of difficult road conditions. Intensive competition among truckers makes it likely that operator savings due to reduced repair and fuel costs, and greater use intensity (ton-km/yr/vehicle) will in part be passed on to producers, but the trucking industry will retain some of the profit. Reduction of transport cost and capacity constraints should also produce a vent for surplus expansion of exported products when combined with price and policy initiatives being pursued by USAID and the GOS. Interregional trade in food grains should also benefit once intraregional demand based on population growth and periodic food deficits is met.

Transhumants and nomads may benefit from the Kosti-El Obeid road, but it is difficult to predict the road's impact precisely. Transhumant and nomads now sell their livestock in El Obeid where traders from Omdurman hire herders to trek them north. Upon completion of the road, traders will transport more sheep and some cattle by truck, particularly since sheep are not well suited to long treks. To the extent that cheaper transport reduces urban meat prices and leads to higher demand for meat, transhumants and nomads may find increased demand for their livestock. Under these circumstances livestock offtake rates and producer prices will rise. Even if the road entails some social cost by leading to expanded farms which block traditional migration paths, it will not be without compensating financial benefits.

5. Participation

Because construction and maintenance of the Kosti-El Obeid road will have a limited employment impact, rural participation is best evaluated in terms of whether farmers have an incentive to contribute to the project goal of increasing agricultural production. As previously noted, long-term increases in production capacity will be measured by farmer income, technical developments and availability of extension services -- all factors which the road will affect positively. Even in the short-run farmers are likely to produce more by bringing additional acreage under cultivation. In deciding how much to plant the farmer balances the cost of cultivating additional land, usually in terms of the labor it requires, with the likely profit on his product and the risk of low rainfall wiping out the fruits of his labor. Currently when farmers have planted a minimum acreage to provide a subsistence income, the value of planting additional land is low because high transport costs reduce the market value of his crop while most of the returns in the marketing system remain with merchants. These factors, combined with risk, now make it more attractive for farmers to dedicate their time to off-farm activities thereby limiting acreage expansion.

As the return on agricultural production increases, farming patterns may also change. To some extent, reduced transportation costs will make farming more profitable. The proposed road will also make villages more accessible to urban crop buyers, thus increasing competition for crops and forcing some redistribution of agricultural profits from merchants to producers. The Kosti-El Obeid road will not completely revamp agricultural marketing in Kordofan, but by encouraging competition it will lead to significant changes which will benefit farmers. The chance to make more on what is produced, combined with the long-term income effects of lower input and consumer goods prices, will give the farmer an incentive to plant and produce more.

6. Impact

The immediate impact of an improved road will be on prices. Once completed, the road will transform the Kosti-El Obeid track from a farm-to-market route to a key link between major markets in western and central Sudan. Lower transport costs will affect both the costs of commodities brought to villages and farmgate prices. Since the existing track between Kosti and El Obeid is the principal link to tracks which service other villages, those with access to the main road will benefit in addition to those directly on it.

The road's principal long-term impact will be on production and marketing efficiency. In part, production will rise because there will be fewer constraints to distributing new technologies, marketing surplus crops, and reaching farmers with extension services. Those closest to the road will receive these benefits first, but improvement of the main road is a prerequisite to reaching those in more remote areas. Moreover, the link which prices and income have to production suggests that all villages depending on the main road for at least part of their transportation services will have both the incentive and capabilities to produce more as transport costs fall, raising real income levels.

7. Feasibility

Social, cultural and economic conditions in the project area make it likely that farmers will respond to the production incentives created by the proposed road. When asked of the principal problems facing their villages, most farmers respond that transportation is a key development constraint. Daily they see the difficulties of moving goods, and they know from experience that wet season transportation on donkeys and camels is slow and expensive. The majority of the rural population between Kosti and El Obeid will benefit from this project. Most farmers recognize these benefits and their relation to the road and they are willing to participate in attaining the project goal of increasing production, thus making the project socially feasible. USAID/Sudan does not foresee any issues related to the socio-cultural feasibility of this project.

8. Availability of Data Sources

USAID, the African Development Bank (ADB), the Norwegian Government and the Government of Sudan will invest at least \$140,000,000 in the construction of the Western Agricultural Marketing Road. It is not extraordinary to anticipate that the impact of such a large-scale project on agricultural

income, off-farm employment, migration and access to services will be great. In evaluating this impact, USAID has an interest in:

1. Restricting the scope of information required to basic, feasible measures.
2. Minimizing the cost and effort of data gathering and analysis.

Both objectives can be achieved through reliance on the following published information:

1. Census Section, Department of Statistics, Ministry of Finance and Economic Planning, GOS 1983 Census.
2. Evaluation and Monitoring Department, Agricultural Bank of Sudan, Umm Ruwaba Branch, Preliminary Report on APP/East Kordofan March 1979.
3. University of Kentucky, INTSORMIL, Farming Systems Research in North Kordofan, Report No. 2. Prepared for USAID, November 1982.

Administrative Analysis

Roads and Bridge Public Corporation Capabilities

A. Organization and Staff

The RBPC was established in 1973 as an autonomous body under the overall jurisdiction of the Ministry of Transport. In 1982 it was transferred to the Ministry of Construction and Public Works. The Corporation is administered by a Board of Directors under the direct supervision of a full-time Chairman. Under the Chairman is the Director General with six Directors responsible for:

- Projects (Design and Contracts Supervision).
- Construction (Direct Labor).
- Maintenance and Improvements.
- Planning, Statistics and Research.
- Mechanical.
- Administration and Finance.

The RBPC is responsible for the study, design, construction and maintenance of the national road network and bridges in Sudan. It is the only central government body with experience and resources in this field.

The RBPC employs 157 engineers, 116 technicians, 237 accountants, clerks and storekeepers. It also employs 1170 laborers, approximately 75 percent of whom are skilled. Besides this, it also recruits casual workers as needed during the implementation of different projects. For the supervision of the construction of the Um Ruwaba-El Obeid road, RBPC will provide five qualified and experienced engineers to work with the engineering supervision team. A senior engineer from RBPC will be designated as the RBPC Project Manager for this project.

B. Experience

Since its establishment in 1973, RBPC has managed the construction of approximately 1770 km of roads. About 400 km of these roads were constructed through direct labor, namely Dubeibat-Dilling-Kadugli road and the Wad Medani-Sennar-Kosti road. For the latter road the British provided a technical assistance team of 5 expatriates who assisted the RBPC construction team in the different field activities and worked under the direct supervision of the project manager who was an RBPC engineer.

The RBPC also successfully managed the construction of 1370 km of roads which were carried out through contracts signed with different international road construction contractors. The construction supervision was mostly done by consulting engineers to whom RBPC engineers were assigned as assistant project managers and construction inspectors. Through this procedure, the

RBPC engineers and technicians gained considerable experience for administering future road projects. The roads constructed through contracts include:

<u>Road</u>	<u>Length (k)</u>	<u>Total Cost (million LS)</u>
a. Wad Medani-Gedaref	227	16.00
b. Gedaref-Kassala	220	29.21
c. Kassala-Haiya	350	61.52
d. Haiya-Suakin-Port Sudan	206	34.74
e. Nyala-Kas-Zalingei	210	40.00
f. Jebel Aulia-Ed Dueim	158	19.12

The RBPC also administered the construction of three main concrete bridges over the White Nile (including Hantoob Bridge) and Jur Rivers.

At the present time, RBPC has the following on-going road construction projects:

- a. Ed Dueim-Rabak 110 km (To be completed August 1984)
- b. El Obeid-Dubeibat 100 km (Improvements)
- c. Nyala-El Fasher 215 km (Improvements)
- d. Sennar-Singa-Damazin 285 km

For the construction phase of the Ed Dueim-Rabak road, RBPC contracted with a German firm. Engineering supervision is being carried out by a consulting firm working in conjunction with RBPC engineers who have been assigned to the supervisory team. The project will be completed by August 1984, long before implementation of the Kosti-El Obeid road begins. The second and third roads are being built to an all weather gravel specification with necessary drainage structures. These roads are financed through a technical assistance program provided by the Dutch Government and are already partially completed. Accordingly, Dutch contractors are performing the construction while RBPC is responsible for the engineering supervision.

As for the fourth road, the Sennar-Singa section was partially completed through the implementation of a contract signed in 1978 with the Arab Contractors (Egypt). Work on this road was terminated by this firm due to internal financial problems. It should be noted however, that the Arab Fund and the Kuwaiti Fund, financiers of the road construction, entrusted RBPC with the completion of the project by direct labor after examining the RBPC's professional capabilities. A contract has been signed with Louis Berger/Kampsax (J.V.), consulting engineers, to provide a construction management team to render technical assistance services to the construction team of the RBPC. Berger/Kampsax are the original designers of the road. Preparatory works are now underway and construction is expected to start soon.

C. Contracting Procedures

Traditionally, the study and design of roads in Sudan is carried out by international consulting engineers through contracts signed with RBPC. During the design phase the engineering drawings and bidding documents are prepared to enable RBPC to call for international competitive bidding. The documents prepared shall include:

- a. Construction Plans (Drawings)
- b. Specifications
- c. Conditions of Contract
- d. Bills of Quantities
- e. Information for Tenderers
- f. Instruction for Tendering
- g. Forms for : Performance Bond
 : Performance Guarantee
 : Tender
 : Appendix to Form of Tender
- h. Contract Agreement and Appendix

A prequalification of contractors will follow the preparation of bidding documents taking into consideration all the rules of the donating agency or government regarding the participation of certain contractors, i.e. origin and source limitations. The prequalification notice is published in international and local newspapers and magazines (for a period of one month). The evaluation of the prequalification sheets is usually carried out by the consulting engineers in another one-month period, and is subject to the approval of the GOS and the donating agency.

After the prequalification process, the selected number of contractors are invited to submit their tenders which shall include the above-mentioned documents that are obtainable from RBPC headquarters or the engineer's office, upon payment of an agreed fee. A site visit is arranged for the contractors to acquaint themselves with the prevailing conditions in the project area. The tendering period is usually between 60 and 90 days.

The tenders are received at the RBPC offices where they are opened in the presence of the contractors' authorized representative.

An Evaluation Committee is then formed by the Director General of RBPC to review and evaluate the documents to select the contractor. The Evaluation Committee usually includes:

- a. A senior RBPC engineer as Chairman;
- b. An engineer from RBPC;
- c. Legal Adviser (RBPC);
- d. Financial Manager (RBPC);

- e. Representative of Purchasing Department (MFEP);
- f. Representative of Planning (MFEP);
- g. Representative of Consulting Engineers.

In some cases the consulting engineers submit an evaluation report. The Committee will then, without the representative of the consulting engineers, carry out its own evaluation, taking into consideration the contents of the evaluation report. The Committee submits its recommendations to the Director General who takes the appropriate action and seeks the approval of the MFEP to sign the contract with the selected contractor. Furthermore, the approval of the financing agency is required before any signature to the contract takes place. When the evaluation report is approved by the MFEP and the financing agency, the Minister of Finance and Economic Planning will delegate his power to the Director General or the Chairman of RBPC to sign the contract. It has been agreed that for the Kosti/El Obeid road project, the Minister of Finance and Economic Planning will authorize the project committee to make the final review of the tender and the award decision, with the chairman of RBPC signing the contract.

In ideal situations the time needed to finalize a contract is 90 days from the opening of tenders.

Source and Amount of Foreign Financing
of RBPC Road Projects

Project	Source and Amount	(Figures in Millions)	
		US\$ eq ^{nt}	LS eq ^{nt}
1. TA to RBPC	IDA Credit: \$7.0 Japan Credit: Y 3,000	7.00 14.31	3.500 7.155
2. Gedaref-Kassala (220 km)	Arab Fund: KD 13.20 Af D. Bank: A/U 4.00	50.57 4.00	25.253 2.000
3. Kassala-Haiya (350 km)	Saudi Fund: SR 91.78 Saudi Govt: \$10.00 OPEC: \$10.95 Italian Credit: LS 5.19	27.30 10.00 10.95 -	13.650 5.000 5.475 5.190
4. Medani-Sennar- Kosti (217 km)	U.K. Assistance: LS 12.117 OPEC: \$3.20	- 3.20	12.117 1.600
5. Kosti Bridge	Italian Govt: Lire 34,240	38.78	19.390
6. Sennar-Damazin (235 km)	Kuwait Fund: KD 9.00 Arab Fund: KD 11.00	34.48 42.15	17.240 21.075
7. Nyala-Kas-Zalingei (210 km)	KFW: DM 33.00 Saudi Fund: \$35.00 Islamic Bank: \$4.50	18.33 35.00 4.50	9.165 17.500 2.250
8. Jebel Aulia- Ed Dueim (158 km)	IDA Credit: \$31.20	31.20	15.600
9. Ed Dueim-Rabak (110 km)	KFW: DM 50.00	27.78	13.890
10. Haiya-Suakin- Port Sudan (206 km)	Govt of Abu Dhabi: LS 27.00	-	27.000

Project	Source and Amount	(Figures in Millions)	
		US\$ eq ^{nt}	LS eq ^{nt}
11. Wed Medani- Gedaref (227 km)	People's Republic of China 69.7 Ch. Remibi	-	16.000
12. Nyala-El Fashar (215 km)	Netherlands Govt: 9.25 Guilders	4.72	2.360
13. El Obeid- Dubeibat (100 km)	Netherlands Govt: 7.7 Guilders	3.93	1.965

RBPC Completed Projects

Road	Construction Firm	A&E Firm	Construction Contract	A&E Contract
1. Wed Medani-Gedaref (227 km)	Chinese Technical Team	No A&E Firm RBPC did the Supervision.	With RBPC under the first Chinese Sudauese Protocol agreement for economic and Technical Cooperation	
2. Gedaref-Kassala (220 km)	Partizanski Put of Yugoslavia	(J.V.) Italconsult Stipe (Italy)	RBPC	With RBPC
3. Kassala-Haiya (350 km)	Recchi-Impresit Lodgiani (J.V.) Italy	Italconsult- Stipe	With RBPC	With RBPC
4. Haiya-Suakin- Port Sudan (206 km)	Strabag Bau (W. Germany)	Italconsult Stipe	With RBPC	With RBPC
5. Nyala-Kas-Zalingei (210 km)	Held & Francke (W. Germany)	Rhein-Ruhr (W. Germany)	With RBPC	With RBPC
6. Jebel Aulia- Ed Dueim (158 km)	Wayss & Freytag (W. Germany)	Louis Berger/ Kampsak (J.V.)	With RBPC	With RBPC
7. Medani-Sennar-Kosti	RBPC (Force Account Method)	No A&E Firm	----	----

RBPC On-Going Projects

Road	Construction Firm	A&E Firm	Construction Contract	A&E Contract
1. Ed Dueim-Rabak (110 km)	Strabag Bau (W. Germany)	Louis Berger/ Kampsak (J.V.)	With RBPC	With RBPC
2. El Obeid-Dubeibat (100 km)	ADUCO (Holland)	DHV (Holland)	With RBPC	With RBPC
3. Nyala-El Fasher (215 km)	Steven Roads (Holland)	Euronconsult (Holland)	With RBPC	With RBPC
4. Sennar-Singa- * Damazin (285 km)	RBPC by Direct Labor	Louis Berger/ Kampsak	---	With RBPC
* Sennar-Singa (completed)	Arab Contractors (Egypt)	Louis Berger/ Kampsak	With RBPC (terminated)	With RBPC

Alternatives to the Proposed RoadA. The Railroad

A logical query regarding the construction of the proposed road is its planned alignment very close to the existing rail line from Kosti to the West. Undoubtedly, from a physical linkage perspective the railroad offers great marketing potential. Unfortunately, however, past performance, most notably over the last ten years, has demonstrated the Sudan Railway Corporation's (SRC) inability to provide effective and reliable service. The SRC is beset with problems including management and organizational inefficiencies, substandard facilities and shortages of spare parts. Freight movements have declined consistently over the past ten years and passenger traffic is no greater now than it was a decade ago. This deterioration occurred in spite of a larger input of foreign exchange provided mainly by the IBRD over a period of almost ten years.

The poor services provided by SRC are perhaps tolerated in part because of the monopoly position which it enjoys and the lack of comparable alternative modes of surface transport over long distances. Breakdowns and substantial delays en route are daily occurrences and freight cars are often difficult to obtain for urgent shipments. Most damaging to the economy are the all-too-common serious delays in transport of perishable or semi perishable crops to the port and machinery and agricultural inputs to the interior, all of which has a crippling effect on agricultural production and foreign trade, resulting in heavy financial losses annually. These losses to the national economy have been documented by different authorities and consultants including a GOS Ministry of Agriculture study of 1978 and the Louis Berger report of 1973. Some of the more substantial losses are:

- Loss of more than LS 1.0 million in export earnings for castor in 1972 was estimated by the Ministry of Agriculture. The SRC was contracted for LS 250 per ton for a delivery date of February/March, but did not meet it, resulting in a reduced price of LS 150 per ton.
- The losses on the 1972 cotton crop export because of delivery delays is roughly estimated at LS 1.3 million. The Cotton Public Corporation estimates the minimum delay because of rail transport to be two months. The loss was estimated by using this average delay together with the 1972 sales figures, at an opportunity cost of capital of 10%.
- The Sudan Gezira Board in the middle of the 1978 shipping season was receiving only 50% of cars needed (Barakat Ginning Factory, Gezira Scheme).
- The Cotton Public Corporation estimates that during 1975 and 1976, 100,000 and 70,000 bales of S.G.B. cotton,

respectively, were spoiled because of rain when SRC failed to provide promised service, resulting in a loss of foreign exchange of about LS 1.1 million.

- In 1972, the Agricultural Reform Corporation had to import tarpaulin to protect its transported cotton from the rain. The cost of the tarpaulin was LS 350,000 in foreign currency.

When one bears in mind the critical situation of the Sudan's balance of payments, the losses caused by SRC become all the more significant.

In essence the following table indicates clearly the declining trend of SRC performance in handling traffic. The peak freight performance during the seventies was achieved in 1970-71 and after a downward trend up to 1974-75, there was a slight recovery in 1975-76. But another downward trend started again mainly due to a steady decrease in locomotive availability. Deterioration however has been very fast since 1979-80. According to RITES (Rail India Technical and Economic, Ltd.), the performance trend of SRC for the current year 1983-84 is not bright and the railway will barely exceed the one million ton-mark.

Year	(Figures in Millions)			
	Freight		Passengers	
	Tons	Ton-Km	Passengers	Pass-Km
1970-71	3.128	2785	3.417	1033
1971-72	3.035	2752	3.242	1044
1972-73	2.90	2625	3.383	1084
1973-74	2.683	2426	2.807	1048
1974-75	2.41	2175	2.950	1101
1975-76	2.60	2620	3.070	1166
1976-77	2.50	2415	3.850	1294
1977-78	2.10	1555	3.030	1192
1978-79	1.120	1456	2.440	1057
1979-80	2.12	1966	2.330	1061
1980-81	1.72	1594	2.040	1170
1981-82	1.69	1608	2.680	900
1982-83*	0.960	848	1.490	629

Source: Statistical data published by the Research department of SRC.

With this prospect in view, the financial health of the system will worsen. This absolute declining trend in the performance of the system is also coupled with a decrease in its market share in relation to other modes of transport. The following table, however, reveals that in 1969-70 the Railway's share in the total transport market was approximately 73% while in 1981-82 it accounted for only 27% of the total transport market in Sudan. The table also indicates that a major share of the market was taken over by road transport which expanded from 0.92 billion ton-km to 3.9 billion ton-km (324%).

Volume of Traffic by Mode in 1969/70 and 1981/82

(In Billions)

<u>Year</u> <u>Mode of Transport</u>	<u>1969 - 1970</u>		<u>1981 - 1982</u>	
	<u>Freight ton-km</u>	<u>% of total</u>	<u>Freight ton-km</u>	<u>% of Total</u>
Rail	2.70	73	1.61	27
Road	0.92	25	3.90	66
Pipeline	-	-	0.28	5
River	0.08	2	0.10	2
Total	<u>3.70</u>	<u>100</u>	<u>5.9</u>	<u>100</u>

The main reason for the diversion of traffic from rail to other modes of transport, as presented in the RITES Consultancy Report, is the substantial contraction of the operational capability of the SRC system primarily due to deteriorating availability and performance of diesel locomotives. This mainly has led to long wait-periods for supply of wagons to the customers and abnormal transit delays. These factors have eroded the confidence of customers in the reliability of the railway system and adversely affected the self-confidence and morale of the railway men.

In assessing SRC efficiency indicators, RITES depicted the following statistical data as a demonstration of the deterioration in SRC:

Turn - round of wagons	26 days
Average lead of loaded traffic	927 kms
Empty running component of the turn-round	24%
Actual average speed of running trains (including stoppages at various stations)	11 kms per hr.

The above figures, state that on an average a wagon has to cover 927 kms of loaded and 250 kms of empty running in the sections in order to be available for next loading to complete the cycle of turn-round of 26 days.

Thus, on the average a wagon is actually moving (including stoppages at way side stations) between terminal yards for (927 km + 250 km) 11 = 107 hrs (say 4.5 days). For the remaining 21.5 days it is either stagnant as it is emptied or loaded in the yards, shunted in the terminal yards, or awaiting loading or off-loading in the sidings.

USAID's own involvement in a local currency financed maintenance project with the SRC over the past four years has shown the difficulty inherent in realizing changes and improvements in an organization hampered by redundant labor, a labyrinthine bureaucracy and a centralized management structure. A recent independent study completed in January 1984 by a local transport and consulting firm confirmed the SRC's lack of progress in meeting the objectives of this project. More importantly, preliminary findings from the previously cited RITES report (March 1984) indicate that USAID's disenchantment with SRC's capabilities are well founded. The consulting team's initial assessments show that management operations, at least since 1976 have resulted in an "unstable state of affairs" within this parastatal organization. There are "wide disparities in different departments of the Corporation" manifested by a concentration of resources at the urban terminals of Khartoum and Atbara while the reaches to the West and South receive little attention. Materials management within the SRC suffers from inadequacy of a forecasting system resulting in "stockouts" and increased down time for locomotives. On the other hand, procurement action is not commensurate with the actual requirements, resulting in excessive stocking of old or obsolete parts. The entire materials management system is essentially done on an ad hoc basis, in fits and bursts, according to foreign exchange availability.

Among other problems plaguing the SRC are:

- a. Current inability of stock in the Port Sudan area due to inadequate availability of shunting engines;
- b. Serious communication failures at the terminals making integral and controlled working of yards problematic;
- c. Inadequate planning of through-running train loads from terminal to terminal, resulting in abnormal detention of individual wagons either in transit yards or for sorting and placement at the terminal sidings;
- d. Lack of comprehensive marshalling orders for the formation of trains in major yards;
- e. Inadequate compilation of wagon detention statistics in important terminals, resulting in lack of managerial control on this important aspect of field operations.

Based on this situation as well as the experience of USAID and other donor's activities with the SRC, the upgrading of the railroad is considered neither a high priority nor a viable option towards improving Sudan's infrastructure. In addition to the high capital and recurrent costs involved in upgrading the railroad, major managerial and organizational changes would be required. At least over the next 5 to 10 years, this does not appear to be a productive course of action.

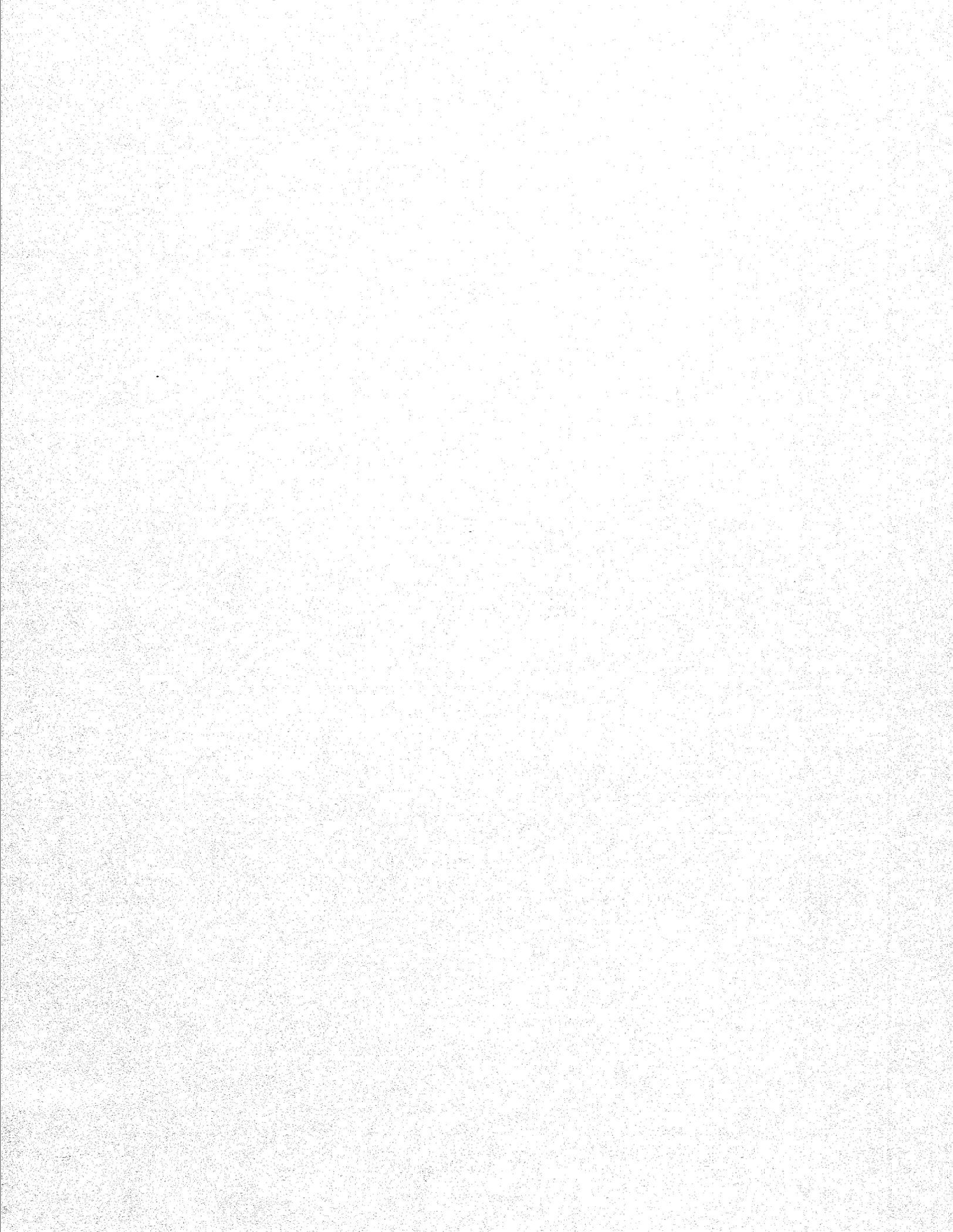
B. Other Road Alternatives

The route chosen for the Western Agriculture Marketing Road follows a natural marketing route which currently provides access to regional and international markets. From casual observation it might appear that a faster and more logical route for a marketing road from the west would be from El Obeid to Khartoum, essentially following a northeast direction. It should be noted however that this alignment has been investigated at various times over the past ten years, most thoroughly in the 1973 Louis Berger, Inc. study. This study confirmed the importance and viability of the El Obeid - Umm Ruwaba - Kosti link. It was subsequently used as a basis for the ADAR* transport study of 1974 as well as the Feeder Roads master plan study of Norconsult 1979. All three of these studies emphasized the importance of an integrated transport system consisting of an expansion of the Sudan's roads to the west and the south in order to provide inter-regional and international marketing links. The GOS subsequently based their national road construction plans on the Berger report.

Berger's study reflected an analysis of the road network from the perspective of actual new construction as well as road improvements. Their methodology was to project traffic of various vehicle types on all of the existing inter-city tracks and roads. Projections were based on historical growth rates of both the economy and of vehicular traffic. Vehicle operating costs of projected 1979 traffic were then estimated and compared with existing (1973) vehicle operating costs. Using benefit-cost analysis, different road links were priority ranked. From this analysis it was determined that the Kosti-Umm Ruwaba - El Obeid link presented a viable, economically feasible link, which when viewed as part of Sudan's larger infrastructure system was and currently is seen as the most important new transport link for Sudan.

The Berger study essentially set the basis for transport and infrastructure priorities with respect to road construction improvement and maintenance for Sudan. The study has assisted in identifying a national system of roads which link the main centers of population, agricultural production, government administration and international trading routes. At this time at least, another, more direct route to Khartoum from El Obeid or any other population center in the west is not considered economically sound. Given the analysis and studies done regarding road transport over the past ten years, the Western Agricultural Marketing Road project is based on sound social and economic considerations as well as GOS priorities.

* Association for Development of Arab Resources, Inc.



Collections and Use of Tolls

Whenever discussing the role of tolls to finance road maintenance in Sudan, it should be kept in mind that all-weather, reliable asphalted roads accounted for only 1073 kilometers of transport infrastructure as late as 1978. Most of this was constructed during the early 1970s. Consequently, a well established, experienced road maintenance capability is only now in a nascent stage. It is not surprising then to learn that a system of tolls for road maintenance should be something relatively new to the Sudan. As it happens, tolls are now currently collected on the asphalted road connecting Khartoum, Wad Medani, Kosti and Port Sudan according to a system officially established as an outcome of a study undertaken by the Ministry of Finance and Economic Planning Transportation Section in 1978. Up until the imposition of tolls, commercial vehicles as opposed to passenger vehicles enjoyed and to a large extent still benefit from operating concessions from a number of sources. Some of these concessions are a significantly lower import duty on diesel, a lower import duty on the purchase of a truck as opposed to a car and low road licensing fees. Because of this, it was correctly reasoned that the payment of tolls would not create a significant burden on truck operators. The World Bank Third Highway Project Staff Appraisal Report states that tolls do not seem to have any noticeable effect on traffic volumes.

RBPC uses a system of tickets for collecting tolls along the Khartoum-Port Sudan route. At this time, tickets are issued at six checkpoints near the principal towns of Soba, Medani, Sennar, Gedaref, Kassala and Port Sudan. Each checkpoint has use of a vehicle. Total staff at these checkpoints currently number 26.

Tolls are levied according to the distance to be traveled by the vehicle as well as the category of vehicle. Enforcement of payment of tolls is theoretically to be made by mobile police patrols carrying out random checks of vehicles and at various police checkpoints along the road.

Collected toll revenue, in accordance with the toll revenue act of 1980, are deposited in a special account with the Bank of Sudan. Toll collection accounts for approximately 1.0 million Sudanese pounds annually. Of this amount approximately 10 percent is used for funding and administering the collection of tolls. The original use of toll funds was to subsidize a somewhat ambitious program of traffic management, rest houses, police and ambulance services and fuel stations, all with the attendant management organization. This plan was eventually disregarded however for the more practical plan of using tolls solely for road maintenance purposes.

Given the flat nature of the terrain surrounding the asphalted road network in the Sudan and the number of tracks which parallel these roads, enforcement of toll collection could potentially be a problem on the Kosti-Umm Ruwaba - El Obeid Road. Vehicular traffic on the Khartoum, Port Sudan road for instance has been known to by pass toll stations simply by leaving the asphalted road and following a track until rejoining the asphalted road a safe distance from the toll booth. This problem will be avoided to a great degree

however on the proposed road since through traffic must cross the only bridge within hundreds of miles over the White Nile at Kostî. A toll station will be established at this juncture to ensure that cargo traffic and passenger vehicles are charged accordingly. Trucks could by pass this toll by taking the Khartoum-Ad Dueim paved route, paying the ferry toll and taking a cross desert track to Tendelti, as much present traffic currently does. However, the time and cost of the desert track route is a discouraging and could be monitored at the Dueim ferry and by selective highway patrolling. During the rainy season there will obviously be more incentive to remain on the hard surface road in both directions.

More important perhaps is the issue of toll fund use, particularly in the case of a country in the present economic straits of Sudan. Experience in other countries regarding toll collection suggests that special road funds are not necessarily inviolate, especially if tax revenues are insufficient to cover other government services. The use of tolls and all road user fees for road maintenance is of particular interest to the World Bank. The Third Highway Project will furnish technical assistance to specifically assist RBPC in planning an annual road maintenance program. An accountant will be provided to set up a system of accounts to segregate road maintenance expenditures from pavement strengthening work and rehabilitation. The RBPC and Bank have agreed to meet annually in October, beginning 1984, to review the annual budget requirements, physical targets and release of funds for road maintenance. The Third Highway Project requires that the Bank must agree to these plans. Accordingly, the Project Agreement for Kostî-El Obeid project will contain a covenant by which USAID and RBPC will meet annually in November/December to review the annual plan for road maintenance that was previously developed with the Bank's assistance and approval. This will permit USAID to keep apprised of developments in road maintenance over the next five years and to evaluate the extent to which maintenance will be provided on the Kostî-El Obeid road. At this stage it is expected that toll charges will be increased by doubling current rates. A proposal for doing so has been presented to the GOS Ministry of Finance and Economic Planning from the Minister of Construction and Public Works. It is expected to be implemented soon.

The GOS has determined that the Kosti-Umm Ruwaba-El Obeid road will be a toll road. The following table presents anticipated toll revenues and routine and patching maintenance costs.*

<u>Year</u>	<u>Toll Revenue</u>	<u>Maintenance Costs</u>	
		<u>Routine</u>	<u>Patching</u>
1988	52,350	113,400	101,000
1992	63,075	113,400	212,000
1997	76,930	113,400	238,000
2002	97,850	113,400	81,000
2007	115,110	113,400	101,000

<u>Year</u>	<u>Toll Revenue</u>	<u>Maintenance Costs</u>	
		<u>Routine</u>	<u>Patching</u>
1988	38,140	92,400	103,000
1992	45,040	92,400	193,000
1997	57,110	92,400	333,000
2002	72,140	92,400	82,000
2007	97,240	92,400	105,000

The toll revenues are based on current toll rates which are expected to double in the near future. At the new toll rates, revenues will cover routine maintenance costs and in later years also cover road patching costs.

In summary, the system of toll collection today is imperfect. If road maintenance were dependent upon toll collections today, this would obviously be a shortfall. However, there is now an awareness of the need to fund road maintenance. The Third Highway Project should result in road maintenance planning and the allocation of funds. This is a subject that will be closely monitored by USAID. It is a subject of the periodic evaluations and specifically a subject of the maintenance study funded under the A&E contract. In view of the above, the PP team believes that everything that can be done is being done to insure that in five years there will be considerable improvement in all aspects of road maintenance. Provision have been made in the project to provide for deficiencies that may exist five years hence.

* Figures in Sudanese Pounds.
Increases in revenues result from traffic increases.
Routine maintenance costs held constant.
Patching costs varied to cover anticipated road deterioration.

CBD Notice, Request for Engineering Services

The Agency for International Development (AID) is seeking proposals from qualified U.S. Engineering firms to provide design and Construction Supervision service for the construction of approximately 185 kilometers of a proposed AID-financed all weather highway to be located between Kostî and El Obeid in the Kordofan Region of Sudan, Africa.

The proposed project consists of providing engineering services for:

- a) The minor modification of plans, cross-sections and quantities of an existing roadway design, the actual design of three road maintenance camps;
- b) The modification and updating of existing contract documents to conform to U.S. highway bidding standards in preparation of an invitation for bid (IFB) package;
- c) The updating of the construction cost estimate;
- d) Providing pre-bid and bidding analysis services;
- e) Providing three (3) full time site construction supervision staff for, the positions of:
 - 1) Resident Engineer
 - 2) Construction Engineer and
 - 3) Laboratory Testing Engineerduring the construction period;
- f) Provide short-term technical assistance, as required;
- g) The preparation during the final construction period, of a road maintenance requirements study to develop a follow-on road maintenance program in the Kordofan Region.

It is estimated that engineering services will be required over a six year period starting in early 1985, however the initial contract will be for four years with provisions for extension. The selected firm will have a direct contract with AID and will operate in the Sudan under the functional supervision of the Roads and Bridges Public Cooperation of the Sudan Government.

Interested and qualified U.S. firms may seek further information regarding this notice from the Agency for International Development, Chief Engineer, Africa Bureau, Office of Technical Resources, Room 2440, Department of State, Washington, D.C., 20052. Telephone 202-632-_____. Firms should also notify USAID/Sudan that they are submitting a proposal. Request for proposals will be available at the above location on October 1, 1984.

Interested firms will be required to submit, with the proposal, prequalification data, as required on AID Standard form (SF) 255. The proposal will require concurrent submission in two parts:

- a) The technical proposal, Part One and
- b) The business management proposal, Part Two.

A 60 day submission time will be given, following availability of the request for proposal, with the estimated closing date being December 1, 1984. Submission of proposals will be made to the Chief Engineer, USAID/Sudan as noted above.

Only U.S. engineering firms are eligible to respond to this notice.

CBD Notice, Prequalification of Construction Contractors

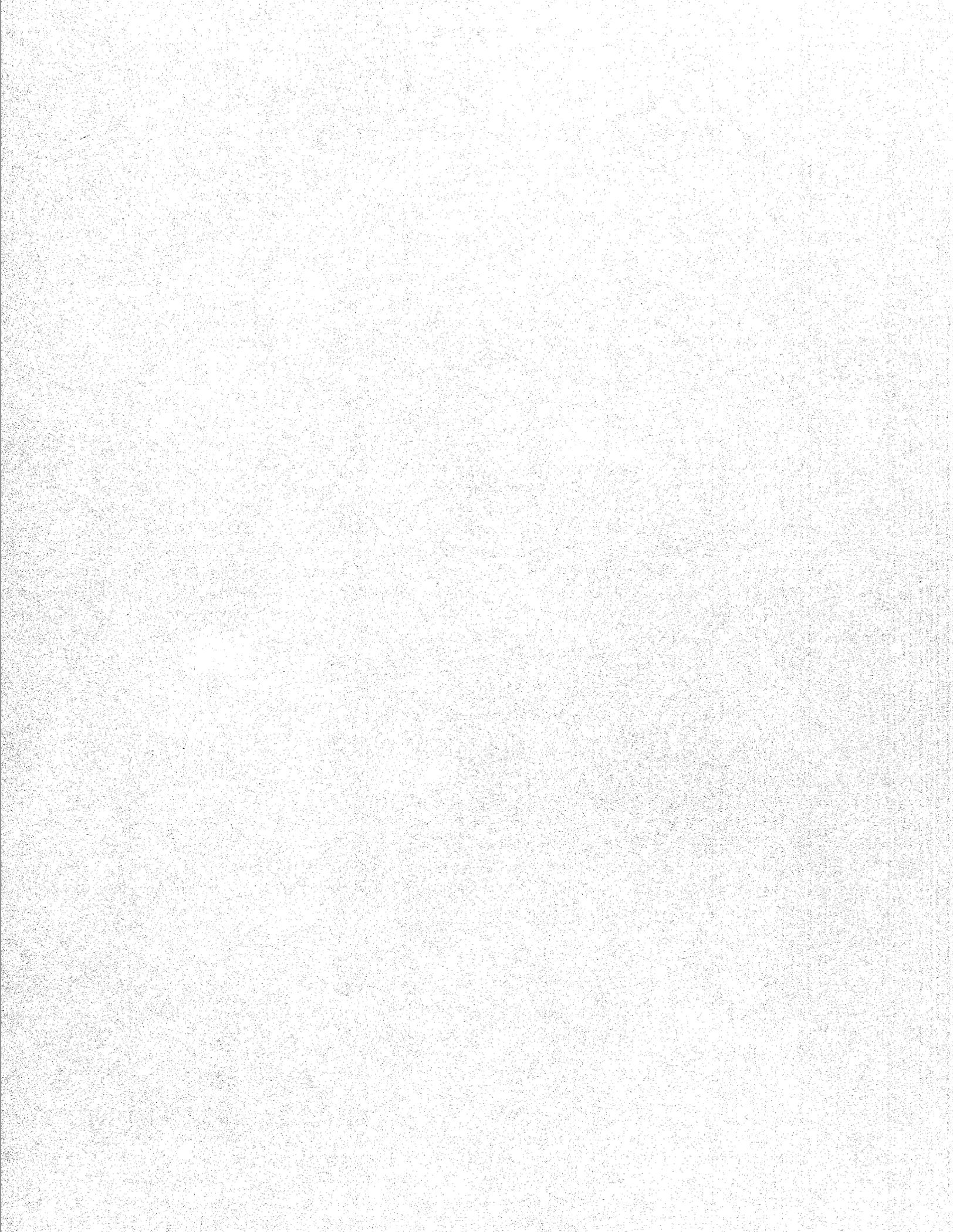
The Agency for International Development (AID) acting as an agent for the Roads and Bridges Public Corporation (RBPC) of the Government of Sudan requests prequalification data from interested U.S. firms and joint venture of such firms who can qualify, through experience with projects of similar type and magnitude for the construction of 185 km. of an all-weather, double bituminous asphalt surfaced road located between Kosti and El Obeid, Kordofan Region of the Democratic Republic of the Sudan. The Project consists of embankment, base, surface and drainage construction for a completed roadway facility. The anticipated construction period is from March 1986 to June 1990.

Financing of this 185 km. section will be under AID Project 650-0069, and firms will be paid in U.S. dollars and Sudanese pounds. A combination unit price and lump sum contract is anticipated. Of the total 300 km. Kosti-El Obeid section, the African Development Bank will be concurrently funding the construction of the remaining 115 km. as a separate tendered contract. The AID financed construction contract will be a host country contract between the RBPC and the successful contractor. Engineering supervision of construction will be the responsibility of the RBPC utilizing the services of an AID financed U.S. Engineering firm. It is planned that the tender will call for the maximum use of Sudanese Pounds and that bid analysis and award will be weighted, as to be described in the bid documents, by the highest component of local currency tendered. Interested U.S. contractors are recommended to investigate sub-contract arrangements with Sudanese, or AID Geographic Code 941 country firms. These firms will be eligible to participate only as sub-contractors under this project. Interested US firms may seek further information and prequalification questionnaires regarding this notice from the Agency for International Development, Chief Engineer, Africa Bureau Office of Technical Resources, Rm. 2440, Department of State, Washington, D.C. 2052. Telephone 202-632-8171. Prequalification information will be available at the above location on February 1, 1985. If a joint venture seeks prequalification, qualification information must be supplied for all firms in the joint venture.

After receiving the qualifying information, a list will be established by the RBPC consisting of those firms to whom invitation for bids will be issued. Prequalified firms wishing to submit bids will be required to visit the Sudan and the site of work before submitting bids.

It is planned that the Invitation for Bid Package (IFB) will be available to prequalified contractors by October, 1985. Only U.S., Code 941 and joint venture firms thereof are eligible to respond to this prequalification notice.

Best Available Copy



Scope of Work

For the Environmental Review of the
Western Sudan Agricultural Marketing
Road Project (650-0069)

I. Purpose: The development of the Western Sudan Agricultural Marketing Road will link the highly productive agricultural areas around El Obeid to Kosti. Kosti being a major river port, is served by the National railway and is linked to Khartoum by an all-weather road. This project will allow a considerable movement of agricultural goods to many places in eastern Africa as well as other parts of Sudan.

II. Overview: The proposed action on this project is to rehabilitate existing tracks linking these two towns. Additionally other activities will be to:

1. Provide a double bituminous road surface on these tracks;
2. Provide an adequate number of new culverts necessary to manage the water flow; and
3. Provide assistance to ensure proper maintenance.

III. Duties and Responsibilities of Contractor:

A. Describe the environment of the project in the region of El Obeid and Kosti, with particular attention to resources at risk;

B. Assess, define, and describe the significant environmental impacts of the project activities with an in-depth discussion of the primary and secondary impacts of the project;

C. Fully define any unavoidable adverse impacts;

D. Evaluate the preliminary engineering design, found in the two prefeasibility studies attached, for optimum environmental protection;

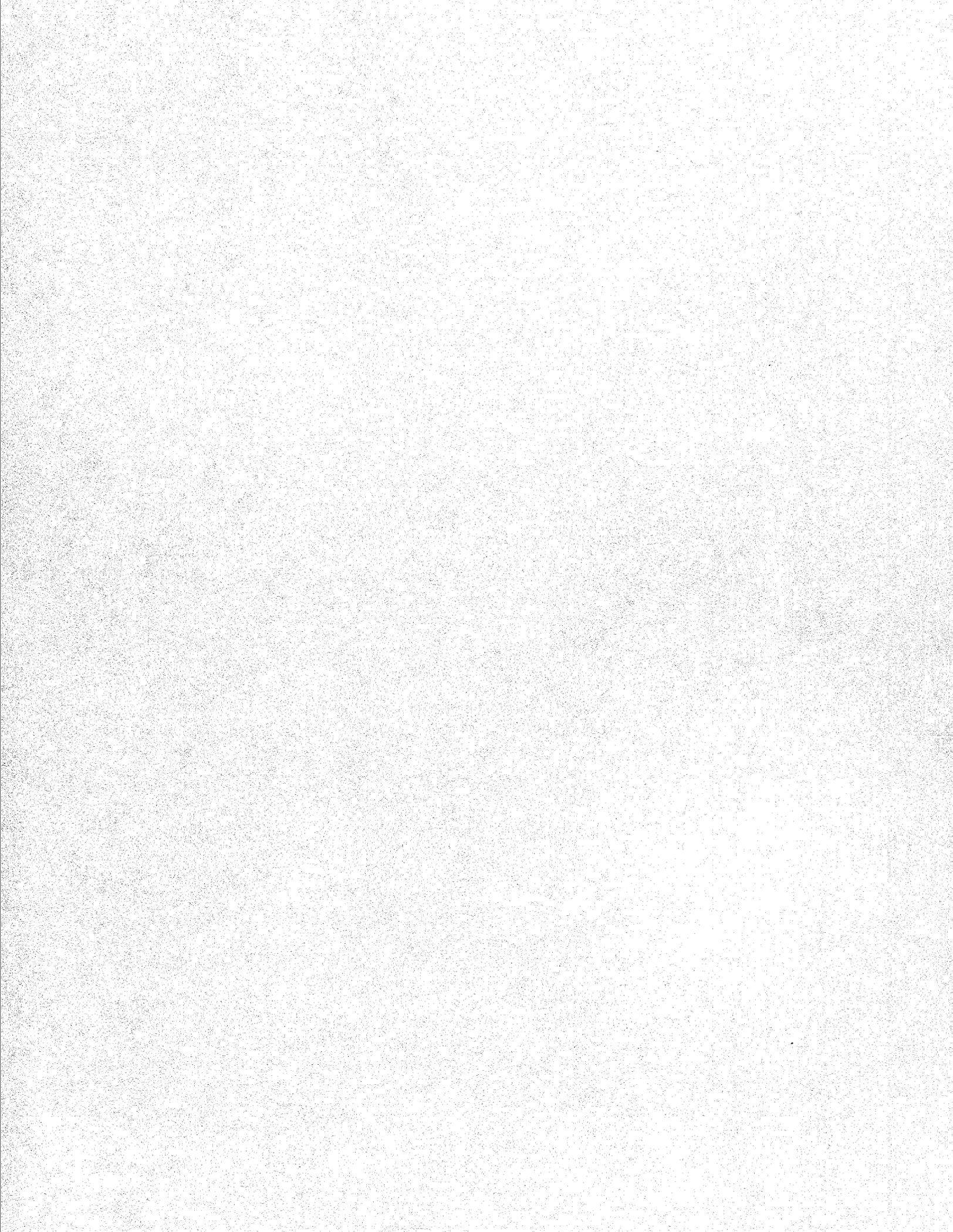
E. Develop and outline a monitoring program to further define and track the resultant environmental impacts. This program should be phased so that Phase I (a two year program) would end just prior to the USAID Kost-i-Umm Ruwaba Evaluation in October, 1986. Phase 2 would be a one-year program ending just prior to the USAID Umm Ruwaba-El Obeid Evaluation in October, 1987;

F. Outline the process whereby a workshop can be organized after one year into the monitoring program. This workshop should make use of: 1) the one year data base from the monitoring program; 2) the periodic reports from IES; 3) an inventory of existing, and forthcoming road projects in Sudan; 4) an inventory of local, region and national expertise in road monitoring; and 5) the guidelines and proceedings of the workshop on road monitoring to be held at the University of Juba possibly in April, 1985. The workshop should define, as a primary goal how to initiate a cooperative effort within Sudan to carry out future road monitoring programs;

G. Outline a cooperative process whereby the GOS can develop the institutional and technical resources to carry out future environmental monitoring of roads in Sudan;

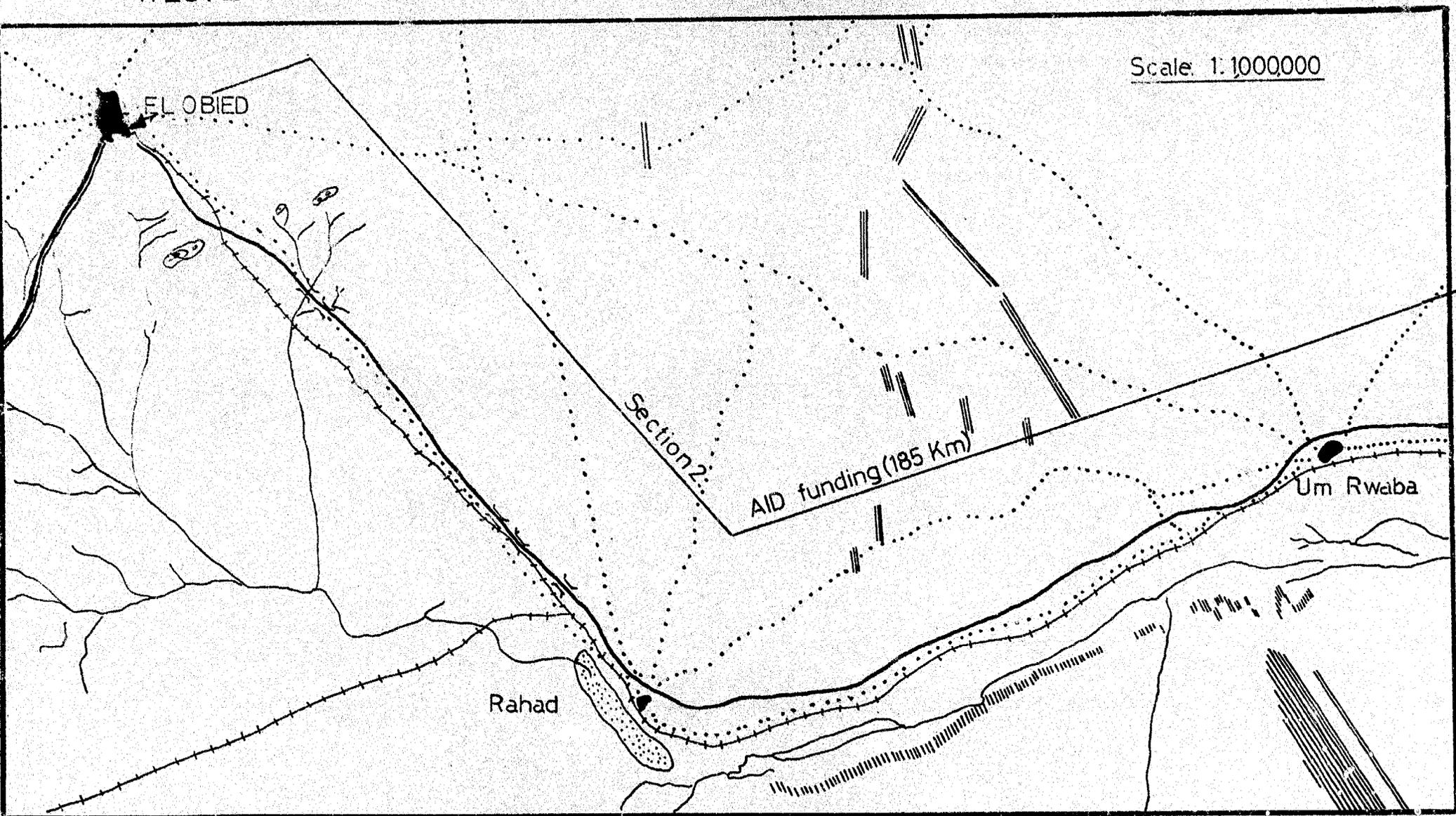
H. Provide an outline budget (expressed in local currency) for the level of funding required to accomplish the above monitoring program;

I. Collect data and provide background information on environmental costs and benefits, including a brief cost/benefit analysis.



WESTERN SUDAN AGRICULTURAL MARKETING ROAD

Scale: 1:1000000

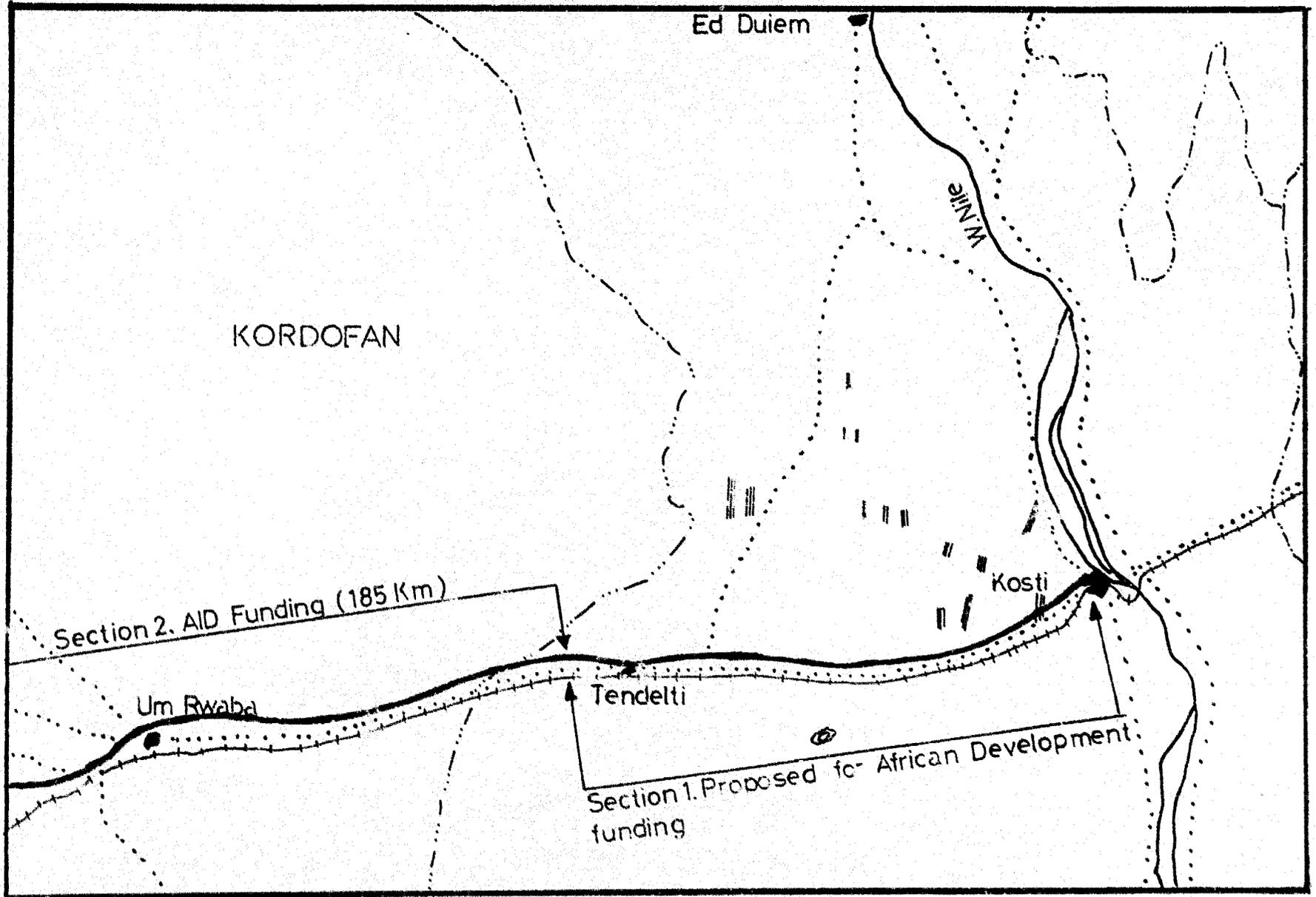


- Tracks
- + Railway
- ~ Watercourse

- Seasonal lake
- Project road
- ≡ Sand dunes

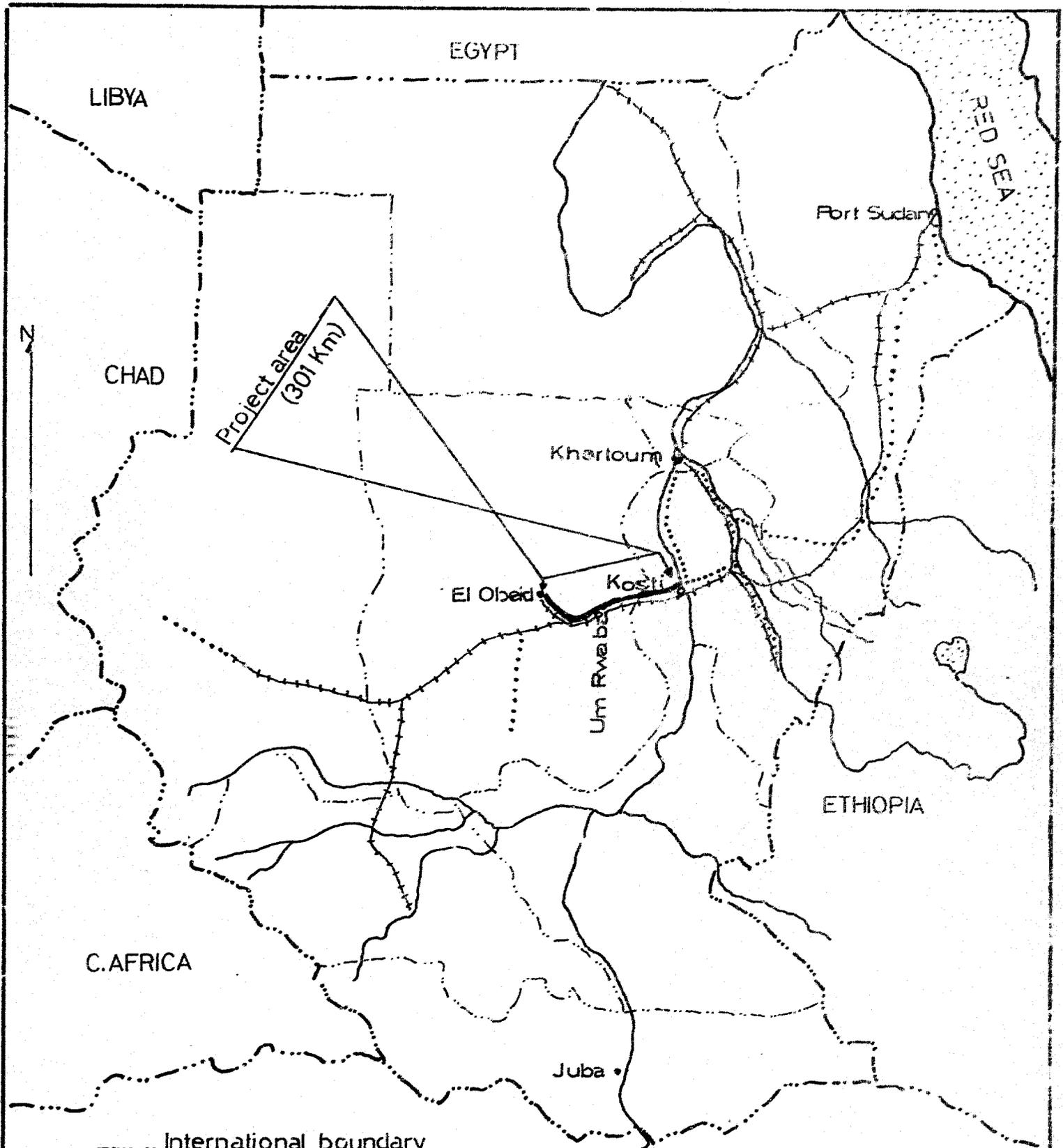
- ≡ Bridge
- ≡ Improved road

WESTERN SUDAN AGRICULTURAL MARKETING ROAD



---+--- Railway
— Project road

≡≡≡ Sand dunes
- - - - - Region boundary
- · - · - Province boundary



- International boundary
- Region boundary
- + -+ Railway
- Project road
- Paved road

Scale: 1: 6,000,000